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(54) Title: METHOD AND SYSTEM OF SECURITY LOCATION DISCRIMINATION (57) Abstract An improved computer network security system and method wherein access to network resources is based on information that includes the location of the connecting user. In general, the less trusted the location of the user, the more the access rights assigned to the user are restricted. A discrimination mechanism and process determines the location of a user with respect to categories of a security policy, such as to distinguish local users, intranet users and dial-up users from one another. Based on information including the location and the user's credentials, an access token is set up that may restrict the user's normal access in accordance with the security policy, such as to not restrict a user's processes beyond the user-based security information in the user's normal access token, while further restricting the same user's access to resources when connecting via a dial-up connection. Restricted tokens are preferably used to implement the location-based discrimination by restricting the security context of users connecting from less trusted locations.		

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METHOD AND SYSTEM OF SECURITY LOCATION DISCRIMINATION**FIELD OF THE INVENTION**

The invention relates generally to computer systems,
5 and more particularly to an improved security model for
computer systems.

BACKGROUND OF THE INVENTION

Current computer security systems determine a user's
10 access to network resources based on permissions granted
according to the user's credentials. This user-centric
model provides a great deal of flexibility for the
increasingly mobile/remote user population. For example,
remote access servers and Internet connectivity allow a
15 user to transparently access corporate resources from
virtually anywhere.

While this flexibility provides advantages to both
the user and the owner of the network, (e.g., a corporate
enterprise), such increased availability and easy
20 connectivity inherently elevates the risk of unauthorized
access. Although encrypted network communication
prevents wire eavesdropping, allowing remote access to
sensitive corporate resources still has an intrinsic
risk. Indeed, regardless of how protected the resources
25 (such as files) are when they are transmitted, there is
still likely to be a subset of sensitive corporate
resources that the company does not want authorized users
to be accessing from just anywhere.

For example, a laptop-computer user may
30 inadvertently display highly confidential corporate
strategy to unintended viewers, such as when working on
an airplane. New, wider-angle laptop screens make it
even more difficult to prevent other passengers from
peering at the monitor contents. Similarly, with the

escalating population of mobile users, the theft or loss of a notebook computer increasingly threatens the security of sensitive corporate data. A user's account and password also may be stolen, particularly if
5 maintained on a stolen laptop. As long as the user has the proper credentials, existing security mechanisms make it simple to remotely download files and perform other remote actions, thus contributing to these and other security risks.

10 In short, remote access servers (RAS) and Internet connectivity enable users to access corporate resources from virtually any location. However, certain locations (particularly remote locations) are less secure than others. For example, because of portability and
15 increased access, files downloaded to a laptop computer are easier to steal than files on a desktop machine in a corporate office. Similarly, unauthorized persons may obtain user accounts and passwords, whereby it is most likely that they will attempt to access corporate
20 resources from a remote location.

SUMMARY OF THE INVENTION

Briefly, the present invention provides an improved computer network security system and method wherein
25 access to network resources is based on information that includes the location of the connecting user. Ordinarily, the less trusted the location of the user, the more the access rights assigned to the user are restricted. A discrimination mechanism determines the
30 location of a user with respect to categories of a security policy, such as to distinguish local users, intranet users and dial-up users from one another. A security provider establishes the access rights of the user such as by setting up an access token for the user

based on information including the location and the user's credentials. An enforcement mechanism uses the access rights set up for the user to determine whether to grant or deny accesses to resources. The location-based
5 access rights may be restricted with respect to the user's normal access rights in accordance with the security policy. For example, the processes of a local user may not be restricted beyond the user-based security information in the user's normal access token, while the
10 same user connecting via a dial-up connection will have restricted processes. Preferable, restricted tokens are used to implement the location-based discrimination by restricting the access of users connecting from less trusted locations.

15 Other objects and advantages will become apparent from the following detailed description when taken in conjunction with the drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

20 FIGURE 1 is a block diagram representing a computer system into which the present invention may be incorporated;

FIG. 2 is a block diagram generally representing virtual locations from which a user may connect to a
25 network;

FIG. 3 is a flow diagram representing the general steps taken to determine the user's location and access level of a user based on that location in accordance with one aspect of the present invention;

30 FIG. 4 is a block diagram generally representing the various components for establishing user access based on location information in accordance with one aspect of the present invention;

FIGS. 5 - 6 comprise a flow diagram representing the general steps taken to determine a user's level of trust based on location information in accordance with one aspect of the present invention;

5 FIG. 7 is a block diagram generally representing a mechanism determining a user's access rights in accordance with an aspect of the present invention;

FIG. 8 is a block diagram generally representing the creation of a restricted token from an existing token in
10 accordance with one aspect of the present invention;

FIG. 9 is a block diagram generally representing the various components for determining whether a process may access a resource;

FIGS. 10 - 11 comprise a flow diagram representing
15 the general steps taken to create a restricted token from an existing token in accordance with one aspect of the present invention;

FIG. 12 is a block diagram generally representing a process having a restricted token associated therewith
20 attempting to access a resource in accordance with one aspect of the present invention;

FIG. 13 is a block diagram generally representing the logic for determining access to an object of a process having a restricted token associated therewith in
25 accordance with an aspect of the present invention;

FIG. 14 is a flow diagram representing the general steps taken when determining whether to grant a process access to a resource in accordance with an aspect of the present invention;

30 FIG. 15 is a diagram representing the communication between a client a server in a challenge - response authentication protocol;

FIG. 16 is a block diagram representing the creation of a restricted token based on authentication credentials

and location discrimination in accordance with one aspect of the present invention;

FIG. 17 is a diagram representing the communication for authenticating a client at a server according to the Kerberos authentication protocol;

FIG. 18 is a block diagram representing the creation of a restricted token based on an authentication ticket and location discrimination in accordance with one aspect of the present invention;

FIG. 19 is a diagram representing the communication for authenticating a client at a server according to the SSL protocol; and

FIG. 20 is a block diagram representing the creation of a restricted token based on an authentication certificate and location discrimination in accordance with one aspect of the present invention.

DETAILED DESCRIPTION

Exemplary Operating Environment

Figure 1 and the following discussion are intended to provide a brief general description of a suitable computing environment in which the invention may be implemented. Although not required, the invention will be described in the general context of computer-executable instructions, such as program modules, being executed by a personal computer. Generally, program modules include routines, programs, objects, components, data structures and the like that perform particular tasks or implement particular abstract data types. Moreover, those skilled in the art will appreciate that the invention may be practiced with other computer system configurations, including hand-held devices, multi-processor systems, microprocessor-based or programmable consumer electronics, network PCs, minicomputers,

mainframe computers and the like. The invention may also be practiced in distributed computing environments where tasks are performed by remote processing devices that are linked through a communications network. In a
5 distributed computing environment, program modules may be located in both local and remote memory storage devices.

With reference to FIG. 1, an exemplary system for implementing the invention includes a general purpose computing device in the form of a conventional personal
10 computer 20 or the like, including a processing unit 21, a system memory 22, and a system bus 23 that couples various system components including the system memory to the processing unit 21. The system bus 23 may be any of several types of bus structures including a memory bus or
15 memory controller, a peripheral bus, and a local bus using any of a variety of bus architectures. The system memory includes read-only memory (ROM) 24 and random access memory (RAM) 25. A basic input/output system 26 (BIOS), containing the basic routines that help to
20 transfer information between elements within the personal computer 20, such as during start-up, is stored in ROM 24. The personal computer 20 may further include a hard disk drive 27 for reading from and writing to a hard disk, not shown, a magnetic disk drive 28 for reading
25 from or writing to a removable magnetic disk 29, and an optical disk drive 30 for reading from or writing to a removable optical disk 31 such as a CD-ROM or other optical media. The hard disk drive 27, magnetic disk drive 28, and optical disk drive 30 are connected to the
30 system bus 23 by a hard disk drive interface 32, a magnetic disk drive interface 33, and an optical drive interface 34, respectively. The drives and their associated computer-readable media provide non-volatile storage of computer readable instructions, data

structures, program modules and other data for the personal computer 20. Although the exemplary environment described herein employs a hard disk, a removable magnetic disk 29 and a removable optical disk 31, it should be appreciated by those skilled in the art that other types of computer readable media which can store data that is accessible by a computer, such as magnetic cassettes, flash memory cards, digital video disks, Bernoulli cartridges, random access memories (RAMs), read-only memories (ROMs) and the like may also be used in the exemplary operating environment.

A number of program modules may be stored on the hard disk, magnetic disk 29, optical disk 31, ROM 24 or RAM 25, including an operating system 35 (preferably Windows NT), one or more application programs 36, other program modules 37 and program data 38. A user may enter commands and information into the personal computer 20 through input devices such as a keyboard 40 and pointing device 42. Other input devices (not shown) may include a microphone, joystick, game pad, satellite dish, scanner or the like. These and other input devices are often connected to the processing unit 21 through a serial port interface 46 that is coupled to the system bus, but may be connected by other interfaces, such as a parallel port, game port or universal serial bus (USB). A monitor 47 or other type of display device is also connected to the system bus 23 via an interface, such as a video adapter 48. In addition to the monitor 47, personal computers typically include other peripheral output devices (not shown), such as speakers and printers.

The personal computer 20 may operate in a networked environment using logical connections to one or more remote computers, such as a remote computer 49. The remote computer 49 may be another personal computer, a

server, a router, a network PC, a peer device or other common network node, and typically includes many or all of the elements described above relative to the personal computer 20, although only a memory storage device 50 has
5 been illustrated in FIG. 1. The logical connections depicted in FIG. 1 include a local area network (LAN) 51 and a wide area network (WAN) 52. Such networking environments are commonplace in offices, enterprise-wide computer networks, Intranets and the Internet.

10 When used in a LAN networking environment, the personal computer 20 is connected to the local network 51 through a network interface or adapter 53. When used in a WAN networking environment, the personal computer 20 typically includes a modem 54 or other means for
15 establishing communications over the wide area network 52, such as the Internet. The modem 54, which may be internal or external, is connected to the system bus 23 via the serial port interface 46. In a networked environment, program modules depicted relative to the
20 personal computer 20, or portions thereof, may be stored in the remote memory storage device. It will be appreciated that the network connections shown are exemplary and other means of establishing a communications link between the computers may be used.

25

Location Discrimination

In accordance with one aspect of the present invention, there is provided a method and system that determines access to resources based on the location of a
30 user, (in addition to the user's normal access rights based on the user's credentials). For example, valid users determined to be at a local, secure location are given their full access rights, while those at a remote location are given restricted access rights.

Moreover, the amount of restriction may vary based on the type of remote access.

By way of example, FIG. 2 shows a number of locations from which a user may connect to a corporate network (comprising local machine or machines) 60. Users may connect through computers 62₁ - 62_n via a local area network (such as LAN 51 and network interface 53 as shown in FIG. 1). Other users may connect through remote office servers 64₁ - 64_n, e.g., via a T1 connection, while others may be connected through the Internet via a virtual private network (VPN) 66. Still other users may connect through any number of remote access servers (e.g., 68₁ - 68₂), and in numerous other ways from other locations (not shown).

In keeping with the invention, the level of access granted to a user for accessing network resources is dependent on the (virtual) location from where a given user is connected. For example, users connected to the local machine 60 via a LAN 62₁ may be given their full access rights, users through a remote office 64₁ somewhat restricted rights, and users through RAS 68₁, 68₂ or the VPN 66 substantially restricted access rights.

As can be readily appreciated, as used herein, the term "location" is a logical concept related to the type of location connection rather than a physical concept related to the distance from which the connection is originating. For example, a user can connect to the network 60 via the RAS 68₂ from virtually any physical location that has any type of telephone service. Similarly, a user may connect from an "Intranet" location that may be relatively far (physically) from the local machine 60. Indeed, a RAS 68₁, 68₂ dial-up user may be closer in physical distance than user at a remote office 64₁ connecting via a T1 line, even though the dial-up user

will ordinarily be considered less secure. As such, as used herein, each location from which a user may connect is considered a virtual location rather than a physical place. Notwithstanding, the present invention may also
5 further operate with some regard to physical location if the user's physical location is actually known (e.g., via caller ID, the invention may further restrict access to all RAS users calling from a certain area code).

To accomplish location discrimination, there is
10 provided (e.g., in the network machines 60) a mechanism / process 67 for reliably determining the location of a user. Note that the mechanism / process 67 may comprise various components in one machine or distributed among numerous machines in the network. Moreover, as described
15 herein, there are two different mechanisms for IP address location discrimination. A first is based on an Internet Location Service (ILS) 69, while the other is based on assigning ranges of IP addresses (administrated preferably via the directory services) to clients in
20 various locations, and using trusted routers to prevent the use of a more trusted IP address from a less trusted location. Both approaches work on any network with a routing mechanism and well-defined, trusted access points.

25 A first (ILS) way to determine if a user is not in a trusted location is for the mechanism 67 to check to see if the user is connecting through a remote access server (RAS), and if so, is therefore remote and less trusted. To this end, when RAS authenticates the remote user
30 logon, as represented by step 300 of FIG. 3, RAS assigns the user an Internet Protocol (IP) address and registers this user and IP address with the ILS (Internet Location Service) 69. As shown in the flow diagram of FIG. 3, if the IP address is listed in the ILS (step 302), the user

is logged on to through this RAS cluster and is thus untrusted. Such users will be given restricted access, such as by setting a certain reduced access level (step 304) and then using that level to assign (restricted) access rights (step 310), as described in more detail below.

However, if a user's IP address is not listed in the ILS 69 as a RAS IP address, then that user is not necessarily local and trusted. By way of example, if a user logs on through a RAS server in Europe, and then wants access therethrough to a Charlotte (North Carolina) domain, the Charlotte RAS ILS does not have the European RAS connection listed with its Local ILS. Accordingly, for a user not listed with a Local ILS 69, additional information is needed to determine the user's location.

One piece of additional information is the assigned IP address, which is evaluated at step 306. If the IP address is not within the range of local, trusted, IP addresses assigned by the local machine, then the user is not local. Accordingly, the mechanism / process 67 at step 306 will branch to step 304 where the level is set to untrusted as described above. If however the address is within the range of local, trusted, IP addresses, then the user is local but has not connected via RAS, and thus is trusted. Such users will be given normal access, such as by assigning the user a trusted access level (step 308) and then using that level to assign access rights (step 310), as described in more detail below.

Note that the full routing path for a connection is available to a server, and thus when determining the location, access is assigned based upon the least trusted location (i.e., the "weakest link") through which a user's packets are being routed. Moreover, when an IP address is not in a range of "untrusted" locations, it is

not assumed to be within a trusted range, but rather location discrimination is inclusive rather than exclusive in nature, i.e., a list of trusted IP ranges is tested for assigning levels rather than assigning levels
5 by omission from a list of untrusted locations.

It should be noted that, like other electronic security systems, in general, the level of care with which the present invention is used is also responsible for the overall security results. For example, care
10 should be taken when segregating a network with different trust levels, items should be routed appropriately, internal procedures should not allow someone, for example, to install a RAS server on a desktop machine in the corporate office for personal use, and so on.

15 The above example provides a simplified, two-level local discrimination mechanism 67. However, for finer grained multiple trust level control, IP addresses may be assigned by servers in ranges that correspond to additional location information as to the location from
20 which the user is connecting. RAS servers may be further arranged with a location discrimination mechanism 71 to assign IP addresses in one range for callers from "authorized" phone number, and another range for anonymous or unregistered phone numbers. Note that the
25 mechanism / process 71 may include the same or similar components to the mechanism / process 67 described above, along with additional components, and may be within one machine or distributed among numerous machines in the network. However, in addition to providing finer
30 granularity, maintaining a trusted IP Address range at the domain server takes less time to query than checking with the ILS 69. Moreover, as will become apparent below, to accomplish overall security, there are generally three parts of the mechanism, including a

global database of address to location mappings, trusted address assignment and secure routers / gateways.

The following table sets forth trust levels and IP address ranges which may be assigned to a user based on some policy arbitrarily set up for a hypothetical enterprise. Note that users connecting directly (e.g., via a LAN interface card 53) to the local machine are level zero trusted.

Level	Location	IP Address Range
Trust Level 1	Local Intranet users	111.22.0.0-111.22.255.255 111.24.0.0-111.24.127.255
Trust Level 2	RAS Authorized Users	111.24.128.255-111.24.255.255
Trust Level 3	RAS Anonymous Users	111.25.0.0-111.25.255.255

10

By way of example, FIG. 4 shows three different types of user connections via which users connect to a RAS server (e.g., 68₂). A first user connects a remote computer 70₁ to the RAS server 68₂ by dialing in from a RAS-registered phone number, a second user from a remote computer 70₂ via an unregistered or blocked telephone number, and a third user from any phone number. The first two users have user credentials alleging that they are authorized users of the system, while the third user is not claiming to be an authorized user but is instead only attempting to connect as a guest. To determine the access level, the RAS server 68₂ first determines the telephone number of the calling computer via caller ID 74. If a telephone number is available (e.g., not blocked by the caller), the RAS server 68₂ queries a database (or table) 72 that maintains a list of registered telephone numbers that are allowed increased access to resources.

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In this manner, the user of the remote computer 70₁ calling from a registered number may be given greater access to resources than the user of the remote computer 70₂ calling from an unregistered or blocked telephone number. Moreover, both may have more access rights than a guest user 70₃ regardless of that user's telephone number. For example, the user of the remote computer 70₃ may be only allowed access to files on a public server 76, while the user computer 70₂ calling from the unregistered number may have access to the public server 76 and an employee server 78. Lastly, the user computer 70₁ calling from the registered number may have access to the public server 76, employee server 78 and a confidential server 80, yet still may not have access to a top secret server 82. Such distinctions enable an enterprise to set up any number of access policies. As can be readily appreciated, with the above example, traveling employees would be able to call in from an unregistered location and access some employee-level files, (further restricted by their user-credentials), but not confidential files. Confidential files could only be accessed from a user's home or other known location that has a registered telephone number, while top secret files are not accessible via any RAS connection.

To summarize, FIGS. 5 - 6 comprise an exemplary flow diagram showing how access levels may be assigned according to a predetermined policy. If at step 500 of FIG. 5 a user is connecting via the local machine 60, the trust level is set to zero at step 502, which then continues to step 516 where access rights are assigned based (in part) on the trust level. If not connecting via the local machine, however, the process / mechanism 71 continues to FIG. 6 wherein the type of remote

connection determines the trust level via an assigned IP address. If at step 520 of FIG. 6, the user is not connecting via a dial-up connection, then step 520 branches to step 522 wherein the IP address assigned to the user is in the range of addresses reserved for Local Intranet users. Note that in this simplified example, a user either connects directly to the local machine, via an Intranet connection or via a dial-up connection.

If however step 520 detects that the user is connecting via a dial-up connection, step 520 branches to step 524 to determine the telephone number from which the connection is being made. As can be appreciated, this information may be made available via a caller ID mechanism 72 or the like. Step 526 tests to determine if the telephone number is available, since there is a possibility that the user blocked the caller ID function when originating the call, or possibly that the calling telephone is not capable of activating the feature (e.g., the calling phone is out of a caller ID-equipped area). Note that if the mechanism 72 is capable of distinguishing between intentionally blocked calls or simply not detectable calls, if desired, a policy may discriminate between the two types to set a different trust level. However, in the example herein, if the telephone number is not available regardless of the reason, then step 526 branches to step 532 where an IP address is assigned in the RAS unregistered user range.

If instead the number is available at step 526, step 528 is executed, which uses the number to query the database 74 or the like to determine whether the number is registered as that of a predetermined trusted location. Note that the location information may be optionally combined with the user identity at this time, e.g., a user identified as UserX will be given increased

access if calling from his or her registered home number, but no other user will receive increased access if calling from that number.

If the number is appropriately registered as
5 determined by step 530, then step 530 branches to step 534 where an IP address is assigned in the RAS registered user range for the calling computer. Otherwise, step 530 branches to step 532 where an IP address is assigned in the RAS unregistered user range. The location
10 discrimination process / mechanism 71 then returns to step 504 of FIG. 5 where the assigned addresses will be evaluated by the machine that determines access rights.

At step 504, if the IP address is in the range of local intranet users, then step 504 branches to step 506
15 wherein the trust level is set to one for this user. If not in the range of local intranet users, step 508 tests to determine if the range is within the range of RAS registered users. If so, the trust level is set to two at step 510, while if not, the trust level is set to
20 three at step 512. Once the trust level is set to a level from zero to three, the process then continues to step 516 wherein access rights are assigned based on the trust level of the user in combination with the user's credentials, as described in more detail below.

25 FIG. 7 generally shows the logic for determining access rights in accordance with the present invention. A security provider 88 takes the user credentials 90 and the location information (e.g., the trust level) 92 and determines the access rights 94 for the user based on
30 that information. As described below, in a preferred embodiment, the access rights are placed in an access token that is associated with each of the user's processes, and compared against security information

associated with each resource to determine access to that resource.

Location Discrimination Using Restricted Tokens

5 As will become apparent, the present invention is preferably implemented at the operating system level, and thus covers virtually all possible ways to access information. By way of example, consider protecting a given file on a server. This file may be accessed in
10 many ways, including remote SMB files access, via a script running on the server, via an FTP server running on the server, via a proxy (third machine), and so on. The present invention operates at the system level, making it possible to protect virtually all ways of
15 accessing the file.

The preferred security model of the present invention that is described herein leverages and extends the existing Windows NT security model. Notwithstanding, there is no intention to limit the present invention to
20 the Windows NT operating system, but on the contrary, the present invention is intended to operate with and provide benefits with any mechanism that in some way can limit access to resources based on input information.

In general, in the Windows NT operating system, a
25 user performs tasks by accessing the system's resources via processes (and their threads). For purposes of simplicity herein, a process and its threads will be considered conceptually equivalent, and will thus hereinafter simply be referred to as a process. Also,
30 the system's resources, including files, shared memory and physical devices, which in Windows NT are represented by objects, will be ordinarily referred to as either resources or objects herein.

When a user logs on to the Windows NT operating system and is authenticated, a security context is set up for that user, which includes building an access token 100. As shown in the left portion of FIG. 8, a

5 conventional user-based access token 100 includes a UserAndGroups field 102 including a security identifier (Security ID, or SID) 104 based on the user's credentials and one or more group IDs 106 identifying groups (e.g., within an organization) to which that user belongs. The

10 token 100 also includes a privileges field 108 listing any privileges assigned to the user. For example, one such privilege may give an administrative-level user the ability to set the system clock through a particular application programming interface (API). Note that

15 privileges over-ride access control checks, described below, that are otherwise performed before granting access to an object.

As will be described in more detail below and as generally represented in FIG. 9, a process 110 desiring

20 access to an object 112 specifies the type of access it desires (e.g., obtain read/write access to a file object) and provides its associated token 100 to an object manager 114. The object 112 has a security descriptor 116 associated therewith, and the object manager 114

25 provides the security descriptor 116 and the token 100 to a security mechanism 118. The contents of the security descriptor 116 are typically determined by the owner (e.g., creator) of the object, and generally comprise a (discretionary) access control list (ACL) 120 of access

30 control entries, and for each entry, one or more access rights (allowed or denied actions) corresponding to that entry. Each entry comprises a type (deny or allow) indicator, flags, a security identifier (SID) and access rights in the form of a bitmask wherein each bit

corresponds to a permission (e.g., one bit for read access, one for write and so on). The security mechanism 118 compares the security IDs in the token 100 along with the type of action or actions requested by the process 5 110 against the entries in the ACL 120. If a match is found with an allowed user or group, and the type of access desired is allowable for the user or group, a handle to the object 112 is returned to the process 110, otherwise access is denied.

10 By way of example, a user with a token identifying the user as a member of the "Accounting" group may wish to access a particular file object with read and write access. If the file object has the "Accounting" group identifier of type allow in an entry of its ACL 120 and 15 the group has rights enabling read and write access, a handle granting read and write access is returned, otherwise access is denied. Note that for efficiency reasons, the security check is performed only when the process 110 first attempts to access the object 112 20 (create or open), and thus the handle to the object stores the type of access information so as to limit the actions that can be performed therethrough.

The security descriptor 116 also includes a system ACL, or SACL 121, which comprises entries of type audit 25 corresponding to client actions that are to be audited. Flags in each entry indicate whether the audit is monitoring successful or failed operations, and a bitmask in the entry indicates the type of operations that are to be audited. A security ID in the entry indicates the 30 user or group being audited. For example, consider a situation wherein a particular group is being audited so as to determine whenever a member of that group that does not have write access to a file object attempts to write to that file. The SACL 121 for that file object includes

an audit entry having the group security identifier therein along with an appropriately set fail flag and write access bit. Whenever a client belonging to that particular group attempts to write to the file object and
5 fails, the operation is logged. For purposes of simplicity, auditing will not be described in detail hereinafter, however it can be readily appreciated that the concepts described with respect to access control via restricted SIDs are applicable to auditing operations.

10 Note that the ACL 120 may contain one or more identifiers that are marked for denying users of groups access (as to all rights or selected rights) rather than granting access thereto. For example, one entry listed in the ACL 120 may otherwise allow members of "Group₃"
15 access to the object 112, but another entry in the ACL 120 may specifically deny "Group₂₄" all access. If the token 100 includes the "Group₂₄" security ID, access will be denied regardless of the presence of the "Group₃" security ID. Of course to function properly, the
20 security check is arranged so as to not allow access via the "Group₃" entry before checking the "DENY ALL" status of the Group₂₄ entry, such as by placing all DENY entries at the front of the ACL 120. As can be appreciated, this arrangement provides for improved efficiency, as one or
25 more isolated members of a group may be separately excluded in the ACL 120 rather than having to individually list each of the remaining members of a group to allow their access.

Note that instead of specifying a type of access, a
30 caller may request a MAXIMUM_ALLOWED access, whereby an algorithm determines the maximum type of access allowed, based on the normal UserAndGroups list versus each of the entries in the ACL 120. More particularly, the algorithm walks down the list of identifiers accumulating the

rights for a given user (i.e., OR-ing the various bitmasks). Once the rights are accumulated, the user is given the accumulated rights. However, if during the walkthrough a deny entry is found that matches a user or group identifier and the requested rights, access is denied.

A restricted token is created from an existing access token (either restricted or unrestricted), and has less access than (i.e., has a subset of the rights and privileges of) a user's normal token. As used herein, a user's "normal" token is that which grants access solely based on the identity of the user (via users or groups), with no additional restrictions placed thereon. A restricted token may not allow access to a resource via one or more user or group security IDs specially marked as "USE_FOR_DENY_ONLY," even though the user's normal token allows access via those SIDs, and/or may have privileges removed that are present in the user's normal token. As also described below, if the restricted token includes any restricted security IDs, the token is subject to an additional access check wherein the restricted security IDs are compared against the entries in the object's ACL.

In accordance with one aspect of the invention, an access token is created for a user based on both the identity of the user and the location from which the user is connecting. In general, the less trustworthy the location, the more the token is restricted as to the resources the associated process may access and/or the actions it may perform on those resources. For example, a user that is connected via a LAN may have a normal token associated with that user's processes, while the same user connected via RAS may have his or her processes

associated with a restricted token that is stripped of all privileges.

As mentioned above, one way in which to reduce access is to change an attribute of one or more user and/or group security identifiers in a restricted token so as to be unable to allow access, rather than grant access therewith. Security IDs marked `USE_FOR_DENY_ONLY` are effectively ignored for purposes of granting access, however, an ACL that has a "DENY" entry for that security ID will still cause access to be denied. By way of example, if the Group₂ security ID in the restricted token 124 (FIG. 9) is marked `USE_FOR_DENY_ONLY`, when the user's process attempts to access an object 112 having the ACL 120 that lists Group₂ as allowed, that entry is effectively ignored and the process will have to gain access by some other security ID. However, if the ACL 80 includes an entry listing Group₂ as DENY with respect to the requested type of action, then once tested, no access will be granted regardless of other security IDs.

As can be appreciated, this provides a server with the ability to restrict a user's or group's access to an object based on the location of the user. As described above, the IP address range may be specified based on the user's location, e.g., trust level zero if connecting to the local machine, trust level one if connecting from the intranet or other trusted site, level two if via RAS from an authorized telephone number, and level three otherwise. This range of addresses is then examined to mark certain groups as `USE_FOR_DENY_ONLY`.

By way of example, consider a user identified as UserX having a normal access token including a "TopSecret" SID, a "Confidential" SID, and an "Employee" SID, each of which grant access to TopSecret, Confidential and Employee files (based on their ACLs)

respectively. If UserX is at trust level zero, UserX's normal token is used and there are no location-based restrictions placed thereon. However if at trust level one, then the TopSecret SID is marked USE_FOR_DENY_ONLY in UserX's access token. Similarly, if at trust level two, then both the TopSecret SID and the Confidential SID are marked USE_FOR_DENY_ONLY, while if at level three then the TopSecret SID, the Confidential SID and the Employee SID are marked USE_FOR_DENY_ONLY. Note that access to objects cannot be safely reduced by simply removing a security ID from a user's token, since that security ID may be marked as "DENY" in the ACL of some objects, whereby removing that identifier would grant rather than deny access to those objects. Moreover, no mechanism is provided to turn off this USE_FOR_DENY_ONLY security check.

Another way to reduce access in a restricted token is to remove one or more privileges relative to the parent token. For example, a user having a normal token with administrative privileges may be restricted via the location-based system of the present invention such that unless the user is directly connected to the local machine 60, the user's processes will run with a restricted token having no or in some way reduced privileges. As can be appreciated, the privileges that remain may also be based on levels of trust, e.g., all privileges if local (level zero), some if level one, none if level two or three.

Yet another way to reduce a token's access based on the user's location is to add restricted security IDs thereto. Restricted security IDs are numbers representing processes, resource operations and the like, made unique such as by adding a prefix to GUIDs or numbers generated via a cryptographic hash or the like,

and may include information to distinguish these Security IDs from other Security IDs. As described below, if a token includes any restricted security IDs, the token is subject to an additional access check wherein the

5 restricted security IDs are compared against the entries in the object's ACL. Thus, for example, a Restricted SID may specify "RAS," whereby unless an object's ACL has a "RAS" entry, the user will be denied access to that object.

10 As shown in FIG. 9, restricted security IDs are placed in a special field 122 of a restricted token 124, and, in accordance with the present invention, may identify a location from which a process is requesting an action. As described in more detail below, by requiring

15 that both at least one user (or group) security ID and at least one restricted security ID be granted access to an object, an object may selectively grant access based on that location (as well as a user or group). Moreover, each of the locations may be granted different access

20 rights.

The design provides for significant flexibility and granularity within the context of a user to control what a user is allowed to do from a given location. By way of example, consider the above example wherein users

25 connecting from the local machine are level zero trusted, users connecting from the intranet and trusted sites are level one trusted, users connecting from authorized phone numbers (through RAS) and the Internet are level two trusted and users connecting from restricted sites or

30 unauthorized phone numbers are level three trusted. Then, based on the user's location, (e.g., as ascertained from the user's IP address), level zero through level three trusts may be defined according to some predetermined policy to run as follows:

Level	Restrictions in Security Context
0	No additional restrictions are placed on the user's security context
1	Users operate under restricted context, such as with privileges removed from highly sensitive operations, e.g., Backup/Restore.
2	Users operate under restricted context with all SIDs still enabled, but no privileges.
3	Users operate under restricted context, which has all SIDs disabled using the <code>USE_FOR_DENY_ONLY</code> bit, except, e.g., constant ones such as Everyone and Authenticated Users. All privileges are removed as in Level 2.

To create a restricted token from an existing token, an application programming interface (API) is provided, named `NtFilterToken`, as set forth below:

```

NTSTATUS
NtFilterToken (
    IN HANDLE ExistingTokenHandle,
    IN ULONG Flags,
    IN PTOKEN_GROUPS SidsToDisable OPTIONAL,
    IN PTOKEN_PRIVILEGES PrivilegesToDelete OPTIONAL,
    IN PTOKEN_GROUPS RestrictingSids OPTIONAL,
    OUT PHANDLE NewTokenHandle
);

```

5

The `NtFilterToken` API is wrapped under a Win32 API named `CreateRestrictedToken`, further set forth below:

```

WINADVAPI
BOOL
APIENTRY
CreateRestrictedToken(
    IN HANDLE ExistingTokenHandle,
    IN DWORD Flags,
    IN DWORD DisableSidCount,
    IN PSID_AND_ATTRIBUTES SidsToDisable OPTIONAL,
    IN DWORD DeletePrivilegeCount,
    IN PLUID_AND_ATTRIBUTES PrivilegesToDelete OPTIONAL,
    IN DWORD RestrictedSidCount,
    IN PSID_AND_ATTRIBUTES SidsToRestrict OPTIONAL,
    OUT PHANDLE NewTokenHandle
);

```

As represented in FIGS. 8 and 10 - 11, these APIs 126 work in conjunction to take an existing token 100, either restricted or unrestricted, and create a modified 5 (restricted) token 124 therefrom. The structure of a restricted token, which contains the identification information about an instance of a logged-on user, includes three new fields corresponding to restrictions, ParentTokenId, RestrictedSidCount, and RestrictedSids, 10 shown in boldface below:

```

typedef struct _TOKEN {
    TOKEN_SOURCE TokenSource;           // Ro: 16-Bytes
    LUID TokenId;                       // Ro: 8-Bytes
    LUID AuthenticationId;              // Ro: 8-Bytes
    LUID ParentTokenId;               // Ro: 8-Bytes
    LARGE_INTEGER ExpirationTime;       // Ro: 8-Bytes
    LUID ModifiedId;                   // Wr: 8-Bytes

    ULONG UserAndGroupCount;            // Ro: 4-Bytes
    ULONG RestrictedSidCount;         // Ro: 4-Bytes
    ULONG PrivilegeCount;               // Ro: 4-Bytes
    ULONG VariableLength;               // Ro: 4-Bytes
    ULONG DynamicCharged;               // Ro: 4-Bytes

    ULONG DynamicAvailable;             // Wr: 4-Bytes (Mod)
    ULONG DefaultOwnerIndex;            // Wr: 4-Bytes (Mod)
    PSID_AND_ATTRIBUTES UserAndGroups;  // Wr: 4-Bytes (Mod)
    PSID_AND_ATTRIBUTES RestrictedSids; // Ro: 4-Bytes
    PSID PrimaryGroup;                 // Wr: 4-Bytes (Mod)
    PLUID_AND_ATTRIBUTES Privileges;    // Wr: 4-Bytes (Mod)
    PULONG DynamicPart;                // Wr: 4-Bytes (Mod)
    PACL DefaultDacl;                  // Wr: 4-Bytes (Mod)

    TOKEN_TYPE TokenType;               // Ro: 1-Byte

```

```

SECURITY_IMPERSONATION_LEVEL
    ImpersonationLevel; // Ro: 1-Byte

UCHAR TokenFlags; // Ro: 4-Bytes
BOOLEAN TokenInUse; // Wr: 1-Byte

PSECURITY_TOKEN_PROXY_DATA ProxyData; // Ro: 4-Bytes
PSECURITY_TOKEN_AUDIT_DATA AuditData; // Ro: 4-Bytes
ULONG VariablePart; // Wr: 4-Bytes (Mod)
} TOKEN, * PTOKEN;

```

Note that when a normal (non-restricted) token is now created, via a CreateToken API, the RestrictedSids field is empty, as is the ParentTokenId field.

5 To create a restricted token 124, a process calls the CreateRestrictedToken API with appropriate flag settings and/or information in the input fields, which in turn invokes the NtFilterToken API. As represented beginning at step 1000 of FIG. 10, the NtFilterToken API

10 checks to see if a flag named DISABLE_MAX_SIDS is set, which indicates that all Security IDs for groups in the new, restricted token 124 should be marked as

USE_FOR_DENY_ONLY. The flag provides a convenient way to restrict the (possibly many) groups in a token without

15 needing to individually identify each of the groups. If the flag is set, step 1000 branches to step 1002 which sets a bit indicating USE_FOR_DENY_ONLY on each of the group security IDs in the new token 124.

 If the DISABLE_MAX_SIDS flag is not set, then step

20 1000 branches to step 1004 to test if any security IDs are individually listed in a SidsToDisable Field of the NtFilterToken API. As shown at step 1004 of FIG. 10, when the optional SidsToDisable input field is present, at step 1006, any Security IDs listed therein that are

25 also present in the UserAndGroups field 102 of the parent token 100 are individually marked as USE_FOR_DENY_ONLY in the UserAndGroups field 128 of the new restricted token

124. As described above, such Security IDs can only be used to deny access and cannot be used to grant access, and moreover, cannot later be removed or enabled. Thus, in the example shown in FIG. 8, the Group₂ security ID is marked as USE_FOR_DENY_ONLY in the restricted token 124 by having specified the Group₂ security ID in the SidsToDisable input field of the NtFilterToken API 126.

The filter process then continues to step 1010 of FIG. 10, wherein a flag named DISABLE_MAX_PRIVILEGES is tested. This flag may be similarly set as a convenient shortcut to indicate that all privileges in the new, restricted token 124 should be removed. If set, step 1010 branches to step 1012 which deletes all privileges from the new token 124.

If the flag is not set, step 1010 branches to step 1014 wherein the optional PrivilegesToDelete field is examined. If present when the NtFilterToken API 126 is called, then at step 1016, any privileges listed in this input field that are also present in the privileges field 108 of the existing token 100 are individually removed from the privileges field 130 of the new token 124. In the example shown in FIG. 8, the privileges shown as "Privilege₂" to "Privilege_m" have been removed from the privileges field 130 of the new token 124 by having specified those privileges in the PrivilegesToDelete input field of the NtFilterToken API 126. In keeping with one aspect of the present invention, as described above, this provides the ability to reduce the privileges available in a token based on the location of a user. The process continues to step 1020 of FIG. 11.

When creating a restricted token 124, if SIDs are present in the RestrictingSids input field at step 1020, then a determination is made as to whether the parent token is a normal token or is itself a restricted token

having restricted SIDs. An API, IsTokenRestricted is called at step 1022, and resolves this question by querying (via the NtQueryInformationToken API) the RestrictingSids field of the parent token to see if it is
5 not NULL, whereby if not NULL, the parent token is a restricted token and the API returns a TRUE. If the test is not satisfied, the parent token is a normal token and the API returns a FALSE. Note that for purposes of the subsequent steps 1026 or 1028, a parent token that is
10 restricted but does not have restricted SIDs (i.e., by having privileges removed and/or USE_FOR_DENY_ONLY SIDs) may be treated as being not restricted.

At step 1024, if the parent token has restricted SIDs, step 1024 branches to step 1026 wherein any
15 security IDs that are in both the parent token's restricted Security ID field and the API's restricted Security ID input list are put into the restricted Security ID field 132 of the new token 124. Requiring restricted security IDs to be common to both lists
20 prevents a restricted execution context from adding more security IDs to the restricted Security ID field 132, an event which would effectively increase rather than decrease access. Similarly, if none are common at step 426, any token created still has to be restricted without
25 increasing the access thereof, such as by leaving at least one restricted SID from the original token in the new token. Otherwise, an empty restricted SIDs field in the new token might indicate that the token is not restricted, an event which would effectively increase
30 rather than decrease access.

Alternatively, if at step 1024 the parent token is determined to be a normal token, then at step 1028 the RestrictingSids field 132 of the new token 124 is set to those listed in the input field. Note that although this

adds security IDs, access is actually decreased since a token having restricted SIDs is subject to a secondary access test, as described in more detail below.

5 Lastly, step 1030 is also executed, whereby the ParentTokenId 93 in the new token 124 is set to the TokenId of the existing (parent) token. This provides the operating system with the option of later allowing a process to use a restricted version of its token in places that would not normally be allowed except to the
10 parent token.

Turning an explanation of the access evaluation with particular reference to FIGS. 12 - 14, as represented in FIG. 12, a restricted process 134 has been created and is attempting to open a file object 110 with read/write
15 access. In the security descriptor of the object 112, the ACL 120 has a number of security IDs listed therein along with the type of access allowed for each ID, wherein "RO" indicates that read only access is allowed, "WR" indicates read/write access and "SYNC" indicates
20 that synchronization access is allowed. Note that "XJones" is specifically denied access to the object 72, even if "XJones" would otherwise be allowed access through membership in an allowed group. Moreover, the process 94 having this token 84 associated therewith will
25 not be allowed to access any object via the "Basketball" security ID in the token84, because this entry is marked "DENY" (i.e., USE_FOR_DENY_ONLY).

As represented in FIG. 12, restricted security contexts are primarily implemented in the Windows NT
30 kernel. To attempt to access the object 112, the process 134 provides the object manager 114 with information identifying the object to which access is desired along with the type of access desired, (FIG. 14, step 1400). In response, as represented at step 1402, the object

manager 114 works in conjunction with the security mechanism 118 to compare the user and group security IDs listed in the token 124 (associated with the process 134) against the entries in the ACL 120, to determine if the
5 desired access should be granted or denied.

As generally represented at step 1404, if access is not allowed for the listed user or groups, the security check denies access at step 1414. However, if the result of the user and group portion of the access check
10 indicates allowable access at step 1404, the security process branches to step 1406 to determine if the restricted token 124 has any restricted security IDs. If not, there are no additional restrictions, whereby the access check is complete and access is granted at step
15 1412 (a handle to the object is returned) based solely on user and group access. In this manner, a normal token is essentially checked as before. However, if the token includes restricted security IDs as determined by step 1406, then a secondary access check is performed at step
20 1408 by comparing the restricted security IDs against the entries in the ACL 120. If this secondary access test allows access at step 1410, access to the object is granted at step 1412. If not, access is denied at step 1414.

25 As logically represented in FIG. 13, a two-part test is thus performed whenever restricted Security IDs are present in the token 124. Considering the security IDs in the token 124 and the desired access bits 136 against the security descriptor of the object 112, both the
30 normal access test and (bitwise AND) the restricted security IDs access test must grant access in order for the user's process to be granted access to the object. As described above, the normal access test proceeds first, and if access is denied, no further testing is

necessary. Note that access may be denied either because no security ID in the token matched an identifier in the ACL, or because an ACL entry specifically denied access to the token based on a security identifier therein.

- 5 Alternatively, a token may be arranged to have multiple sets of restricted SIDS, with a more complex Boolean expression covering the evaluation of those SIDS, e.g., grant access if set A OR (set B AND set C) allow access.

Thus, in the example shown in FIG. 12, no access to
10 the object 112 will be granted to the process 134 because the only Restricted SID in the token 124 (field 132) identifies "RAS" while there is no counterpart restricted SID in the object's ACL 120. Although the user had the right to access the object via a process running with a
15 normal token, the process 134 was restricted so as to only be able to access objects having a "RAS" SID (non-DENY) in their ACLs.

Note that instead of specifying a type of access, the caller may have specified MAXIMUM_ALLOWED access,
20 whereby as described above, an algorithm walks through the ACL 80 determining the maximum access. With restricted tokens, if any type of user or group access at all is granted, the type or types of access rights allowable following the user and groups run is specified
25 as the desired access for the second run, which checks the RestrictedSids list. In this way, a restricted token is certain to be granted less than or equal to access than the normal token.

Lastly, it should be noted that access tokens may be
30 further restricted according to criteria other than just location-based criteria. Indeed, restricted tokens allow the setting up of restricted security contexts based on other criteria including the identity of the process (e.g., Microsoft Excel) that is attempting to access a

resource. Moreover, the various criteria may be combined to determine access rights. Thus, for example, RAS access to a network file may be allowed if a user is opening the file via Microsoft Excel, but not via
5 Microsoft Word. As can be appreciated, a virtually limitless number of location-based combinations with other criteria for security discrimination are feasible.

Authentication

10 In accordance with one aspect of the present invention, when a client connects to a server, the server authenticates the client and builds a token for that user based on the client's identity and location information. For example, as shown in FIGS. 15 and 16, in one well-
15 known type of authentication (i.e., NTLM), the client user 200 provides credentials 202 including a user ID to a server 204, which then communicates with a domain server 206 to create a challenge for that user based on the user's stored encrypted password. As represented in
20 FIG. 15, the server 204 returns the challenge to the client 202, and if the client properly responds, the user is authenticated.

In keeping with the present invention, however, rather than simply building a normal token for the user,
25 the user information is combined with the location information 208 by a security subsystem / provider 210 to create a restricted token 212 as described in detail above. The restricted token 212 is associated with each process 214 run at the server 204 on behalf of any client
30 process 216.

As shown in FIGS. 17 and 18, other authentication protocols including the Kerberos protocol may also be used in conjunction with the present invention. According to the Kerberos protocol, authentication of the

connection to the server 220 is accomplished via a ticket 222. The ticket 222 is initially received by the client 224 from a ticket-issuing facility on the network known as a Key Distribution Center (KDC) 226. The ticket 222
5 is re-useable for a period of time, whereby even if the session is terminated, the client 130 does not have to repeat the authentication process while the ticket 222 is still valid.

In keeping with the invention, the information in
10 the ticket 222 (which may include restrictions placed therein by the client 224) is combined by the server's security subsystem / provider 228 with user location information 230 to create a restricted token 232, as described in detail above. The restricted token 232 is
15 associated with each process 234 run at the server 220 on behalf of any client process 236.

Similarly, FIGS. 19 and 20, show another authentication protocol known as SSL. In SSL, the client user 240 first obtains a certificate ID 242 from a
20 certificate authority 246 using public key-based authentication. Assuming a server 248 trusts the certificate authority 246, the client user 240 may use the certificate ID 242 to gain access to the server 248. As represented in FIG. 19, back-and-forth communications
25 take place between the server 248 and client 240 via which the server is able to prove that the certificate ID 242 belongs to the proper user.

The certificate ID 242 includes user information identifying that user as one having an account with the
30 network to which the server 248 is connected. The information is used to access a database 250 having user information (e.g., security ID, group IDs privileges and so on) maintained for the user therein. Then, in accordance with the present invention, the user

information from the database 250 is combined with location information 252 by the server's security subsystem / provider 254 to create a restricted token 256 as described in detail above. The restricted token 256
5 is associated with each process 258 run at the server 248 on behalf of any client process 260.

As can be appreciated, the user information obtained via these and other authentication protocols may be combined with location information to restrict a user's
10 access to resources. Moreover, the type of authentication itself may be made dependent on the location of the user. For example, to increase security, a remote connection may require Kerboros or SSL authentication, while a challenge - response
15 authentication may be sufficient to authenticate a user connecting via a local connection. Since the server has access to the location information, the server may decide the type of authentication required for a particular location. Similarly, the type of authentication may be
20 used to discriminate access rights. For example, the access rights of SSL users may be restricted in one way, Kerboros users in another way and NTLM users in still another way. In the manner described above, restricted tokens provide a convenient mechanism to implement
25 restricted security contexts based on a user's virtual location and/or type of authentication, although other enforcement mechanisms are feasible.

While the invention is susceptible to various modifications and alternative constructions, certain
30 illustrated embodiments thereof are shown in the drawings and have been described above in detail. It should be understood, however, that there is no intention to limit the invention to the specific forms disclosed, but on the contrary, the intention is to cover all modifications,

alternative constructions, and equivalents falling within the spirit and scope of the invention.

WHAT IS CLAIMED IS:

1. In a computer network wherein a user may selectively connect to the network from one of a plurality of virtual locations, a method of providing improved network security, comprising the steps of,
5 determining a location from where the user is connecting, selecting an access level for the user from at least two distinct access levels based on criteria including the virtual location, connecting the user to the network, and
10 determining access of the user to network resources based on information including the access level.
2. The method of claim 1 further comprising the step of assigning an Internet protocol address to the
15 user, the assigned address dependent on the location from where the user is connecting.
3. The method of claim 1 wherein the step of determining a location from where the user is connecting
20 comprises the step of evaluating an Internet protocol address assigned to the user.
4. The method of claim 3 wherein the step of selecting an access level from at least two distinct
25 access levels includes the step of selecting the access level according to the Internet protocol address.
5. The method of claim 1 wherein the step of determining a location from where the user is connecting
30 comprises the step of determining that the user is connecting to the network via a remote access server.

6. The method of claim 5 further comprising the step of determining whether the user is connecting via a dial-up connection.

5 7. The method of claim 6 wherein the user is determined to be connecting via a dial-up connection, and further comprising the step of determining the telephone number from which the user is connecting, comparing the telephone number to a list of registered users, and
10 wherein the step of selecting an access level includes the step of selecting one level if the telephone number is in the list and another level if the number is not in the list.

15 8. The method of claim 1 wherein the step of determining a location from where the user is connecting comprises the step of determining whether the user is connecting to the network via a remote access server, and if the user is connecting via a remote access server, the
20 step of selecting an access level includes the step of selecting an access level corresponding to more restricted access rights.

 9. The method of claim 1 wherein the step of
25 determining a location from where the user is connecting comprises the step of determining that the user is connecting to the network via an intranet.

 10. The method of claim 1 wherein the step of
30 determining a location from where the user is connecting comprises the step of determining that the user is connecting to the network via a virtual private network.

11. The method of claim 1 wherein the step of determining access to network resources based on information includes the step of determining access based on credentials of the user.

5

12. The method of claim 11 wherein the step of determining access to network resources includes the step of creating an access token for the user.

10 13. The method of claim 12 wherein the access token is associated with each process of the user, and wherein the step of determining access to network resources includes the step of comparing information in the access token against security information associated with each
15 network resource.

14. The method of claim 12 wherein the step of creating an access token includes the steps of creating a restricted token from the user's normal token, and
20 removing at least one privilege from the restricted token relative to the parent token.

15. The method of claim 12 wherein the step of creating an access token includes the steps of creating a
25 restricted token from the user's normal token, and changing attribute information of a security identifier in the restricted token to use for deny only access via that security identifier, relative to attribute information of a corresponding security identifier in the
30 normal token.

16. The method of claim 12 wherein the step of connecting the user to the network includes the step of

authenticating the user via a challenge - response protocol.

17. The method of claim 12 wherein the step of
5 connecting the user to the network includes the step of receiving a ticket from the user, the ticket issued by a ticket-issuing facility.

18. The method of claim 12 wherein the step of
10 connecting the user to the network includes the step of receiving a certificate from the user, the certificate issued by a certificate authority.

19. The method of claim 12 wherein the step of
15 creating an access token includes the steps of creating a restricted token from the user's normal token, and adding at least one restricted security identifier to the restricted token.

20. The method of claim 12 wherein the step of
20 determining access to network resources includes the step of comparing user information in the access token and the at least one restricted security identifier against security information associated with each network
25 resource.

21. In a computer network wherein a user may selectively connect to the network from one of a plurality of virtual locations, a system for providing
30 improved network security, comprising, a discrimination mechanism for determining a virtual location from where the user is connecting and for selecting an access level from at least two distinct access levels based thereon, a security provider for setting up access rights of the

user based on information including the access level, and an enforcement mechanism for determining user access to network resources according to the access rights set up therefor.

5

22. The system of claim 21 wherein the discrimination mechanism assigns an Internet protocol address to the user based on the virtual location determined thereby.

10

23. The system of claim 21 wherein the discrimination mechanism evaluates an Internet protocol address assigned to the user.

15

24. The system of claim 23 wherein the discrimination mechanism selects the access level according to the Internet protocol address.

25. The system of claim 21 wherein the discrimination mechanism determines that the user is connecting to the network via a remote access server.

26. The system of claim 25 wherein the discrimination mechanism further determines that the user is connecting via a dial-up connection.

27. The system of claim 26 further comprising a list of registered telephone numbers and a caller-ID mechanism connected to the discrimination mechanism, and wherein the discrimination mechanism accesses the caller ID mechanism to determine a telephone number of the user, and accesses the list to determine if the telephone number is in the list, and if the telephone number is in

the list, determines one access level, and if the number is not in the list, determines another access level.

28. The system of claim 21 wherein the
5 discrimination mechanism determines whether the user is
connecting to the network via a remote access server, and
if the user is connecting via a remote access server,
further selects an access level for the user
corresponding to more restricted access rights relative
10 to the user access rights selected for a direct
connection to the network.

29. The system of claim 21 wherein the
discrimination mechanism includes means for determining
15 when the user is connecting to the network via an
intranet.

30. The system of claim 21 wherein the
discrimination mechanism includes means for determining
20 when the user is connecting to the network via a virtual
private network.

31. The system of claim 21 wherein the security
provider sets up the access rights of the user based on
25 information including the credentials of the user.

32. The system of claim 21 wherein the security
provider creates an access token for the user.

30 33. The system of claim 32 wherein the access token
is associated with each process of the user, and wherein
the enforcement mechanism determines access to the
network resources by comparing information in the access

token against security information associated with each network resource.

34. In a computer server having files thereon, a
5 method of selectively restricting access to the files,
comprising the steps of, receiving a request from an
entity to access a file, selecting an access level for
the entity from at least two distinct access levels based
on criteria including the type of entity, and determining
10 access of the entity to the file based on information
including the access level.

35. The method of claim 34 wherein the entity is a
process of a remote computer system, and wherein the step
15 of selecting an access level for the entity from at least
two distinct access levels includes the step of assigning
a first access level for processes of the local server
and a second access level for processes of remote
computers.

20

36. The method of claim 34 wherein the entity is a
script running on the computer server, and wherein the
step of selecting an access level for the entity from at
least two distinct access levels includes the step of
25 assigning a distinct access level for scripts.

37. The method of claim 34 wherein the entity is an
FTP server running on the computer server, and wherein
30 the step of selecting an access level for the entity from
at least two distinct access levels includes the step of
assigning a distinct access level for FTP servers.

38. The method of claim 34 wherein the entity is a process of a proxy, and wherein the step of selecting an access level for the entity from at least two distinct access levels includes the step of assigning a first
5 access level for processes of the local server and a second access level for processes of proxies.

10

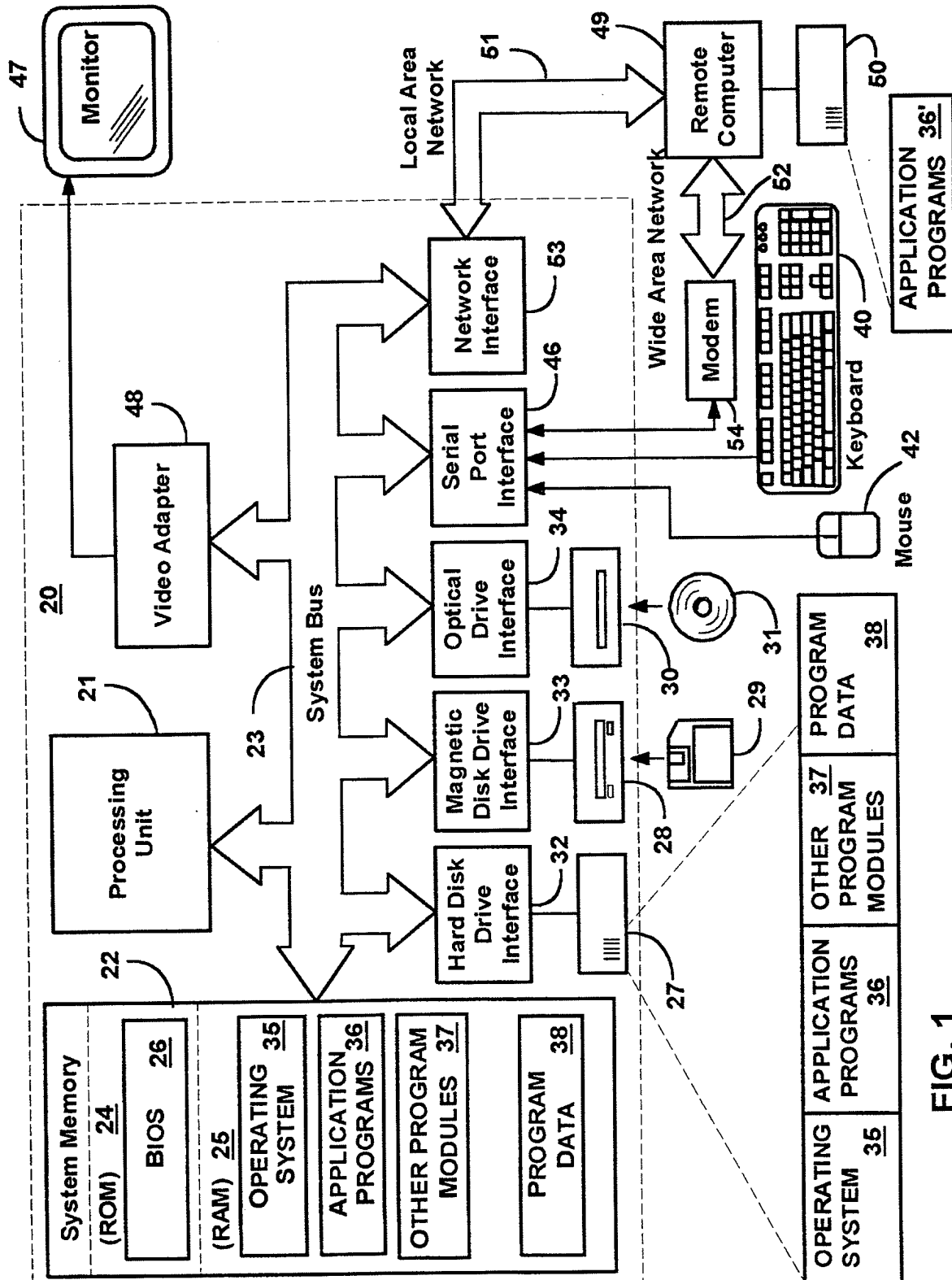


FIG. 1

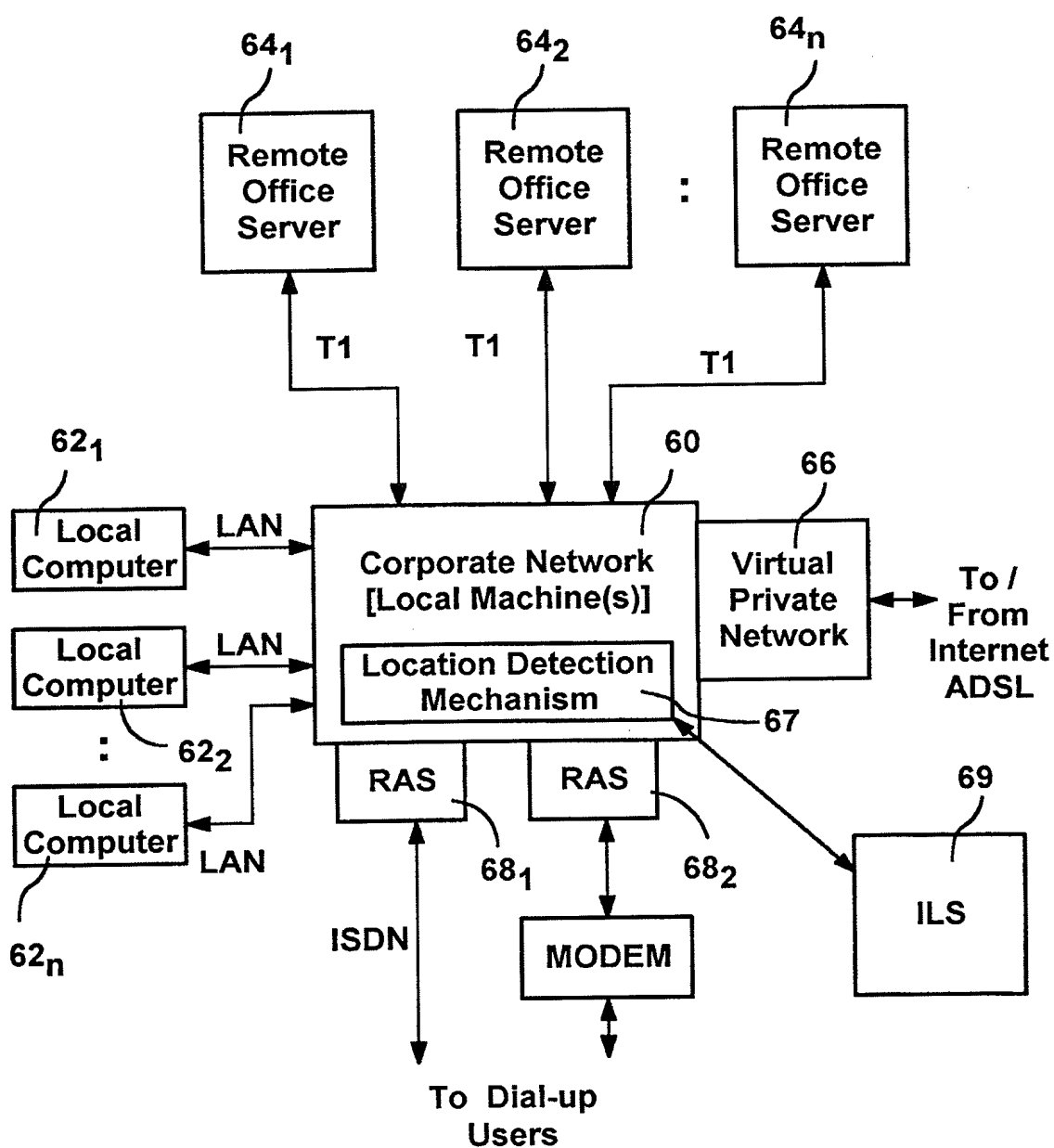
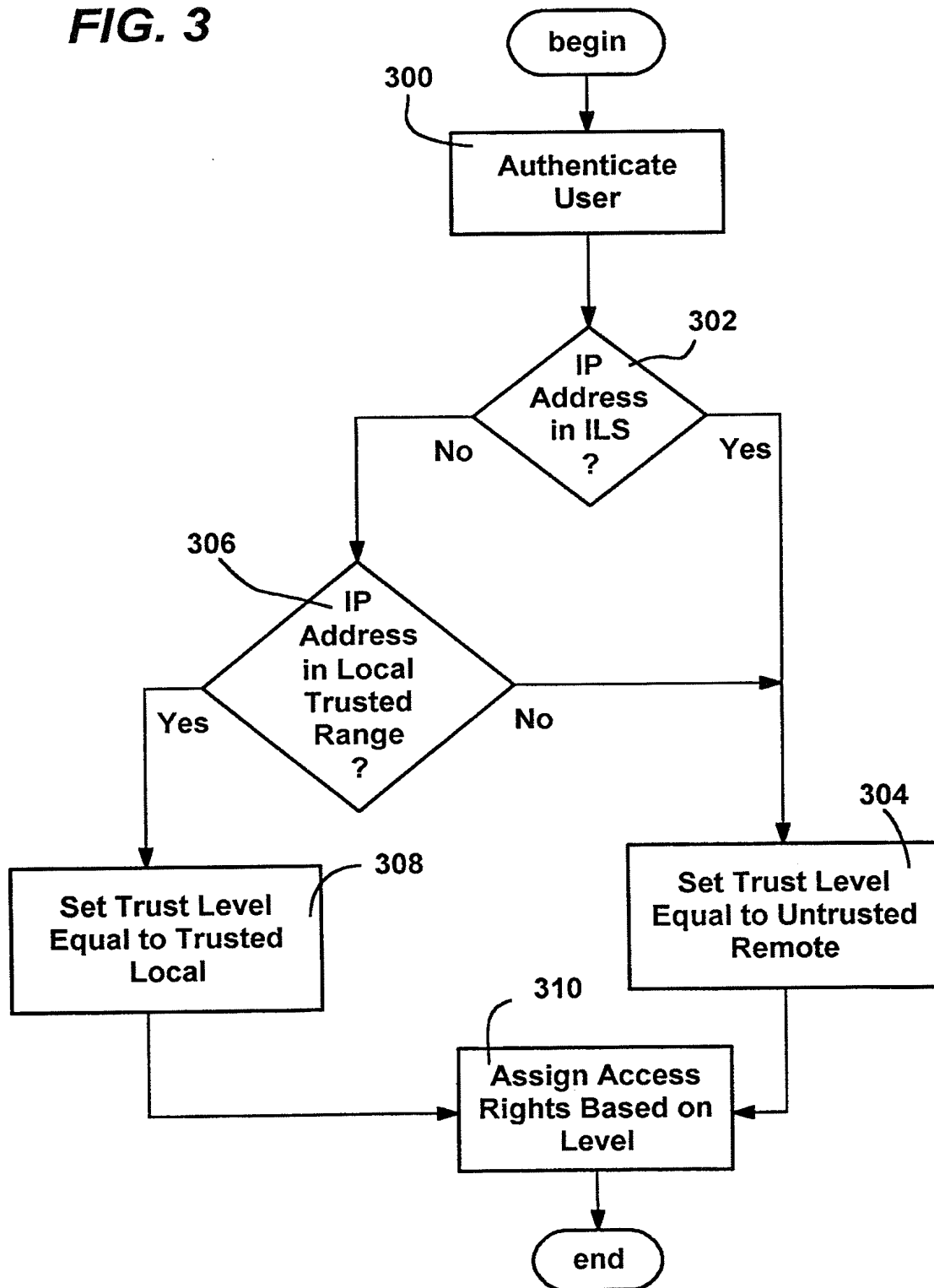
**FIG. 2**

FIG. 3

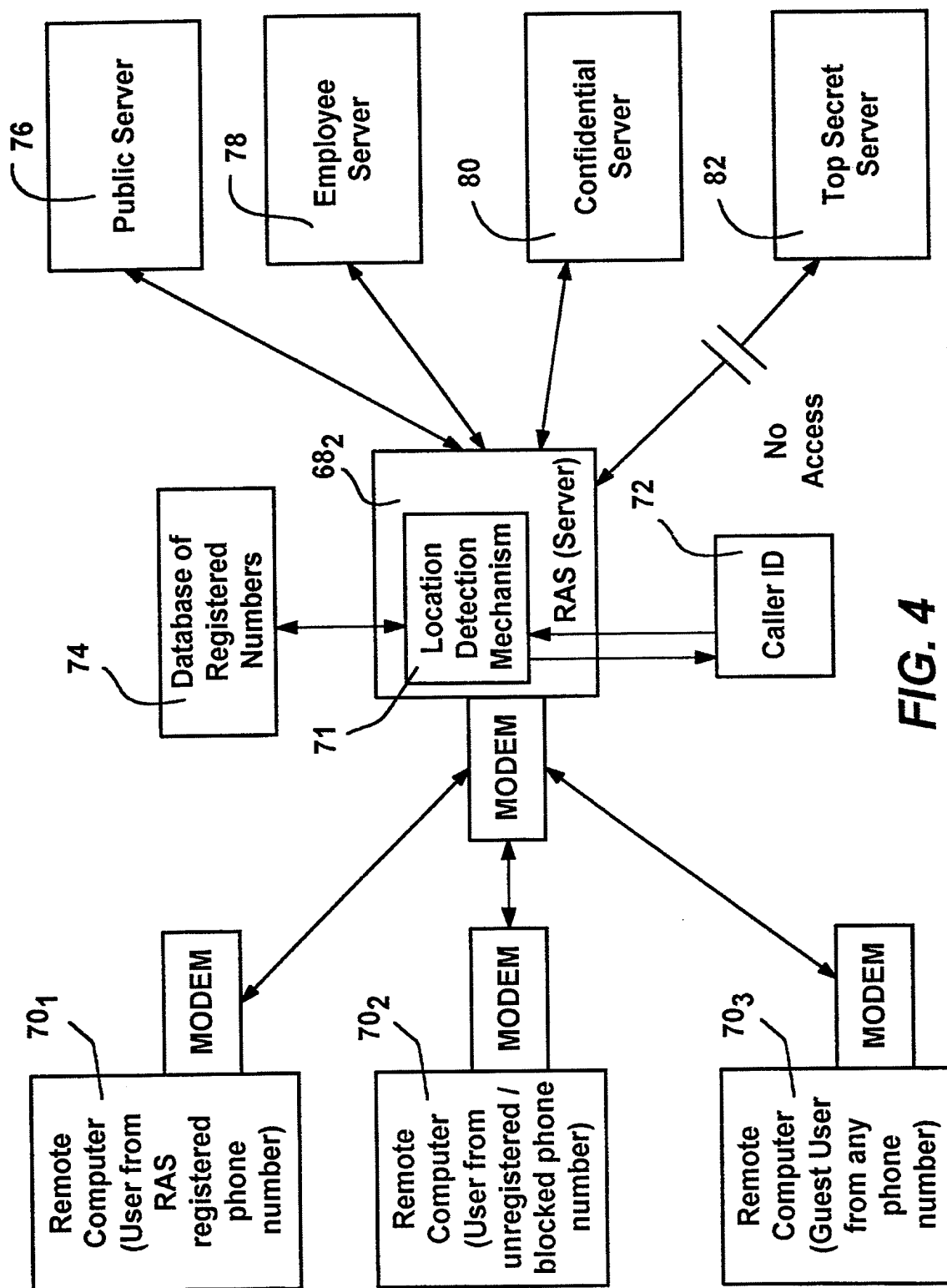


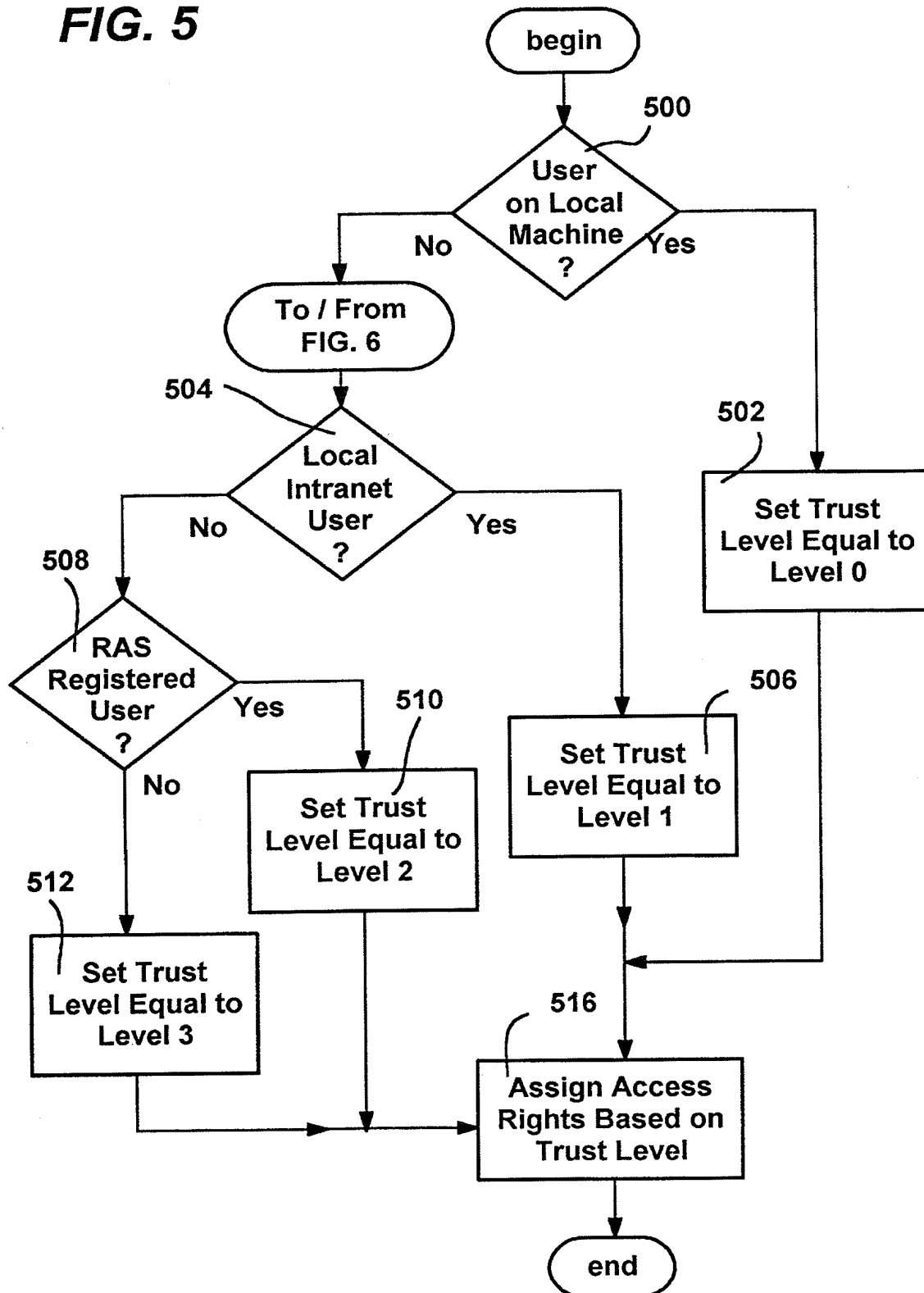
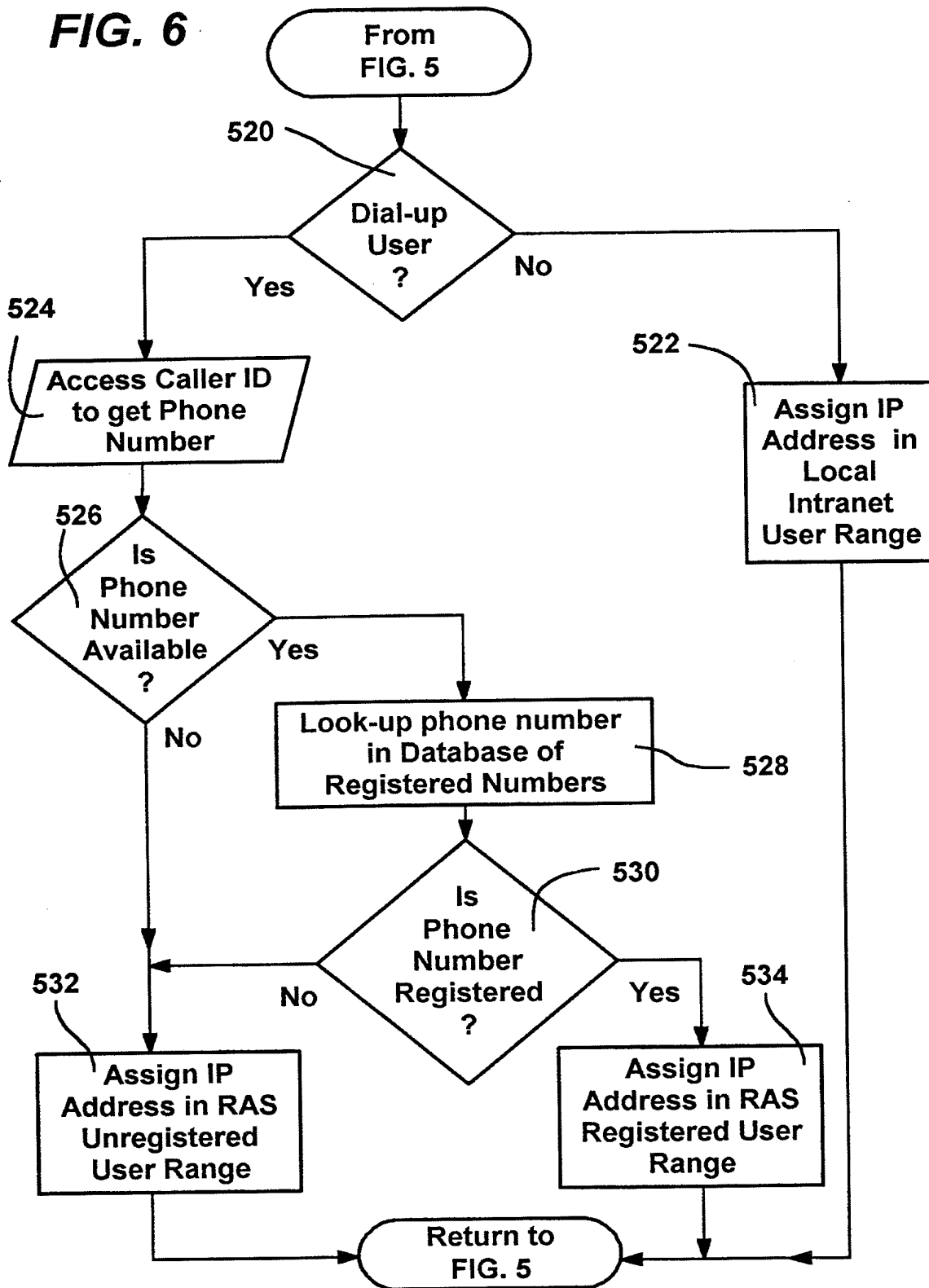
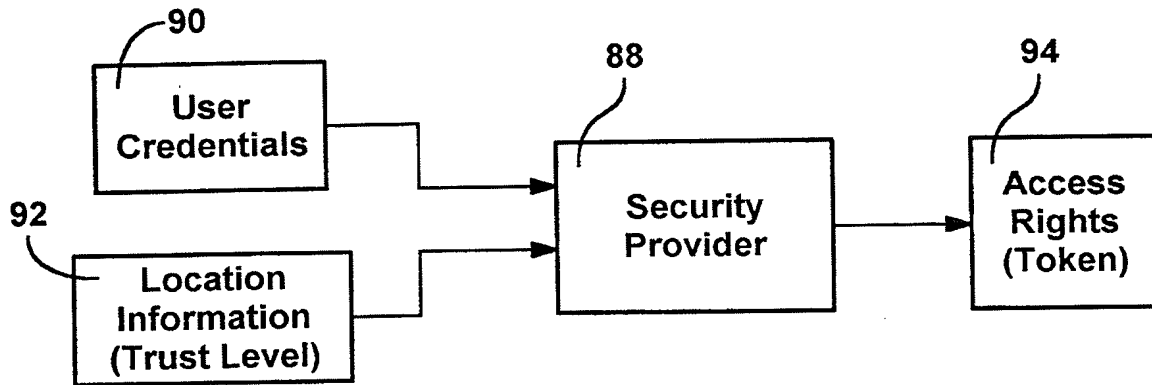
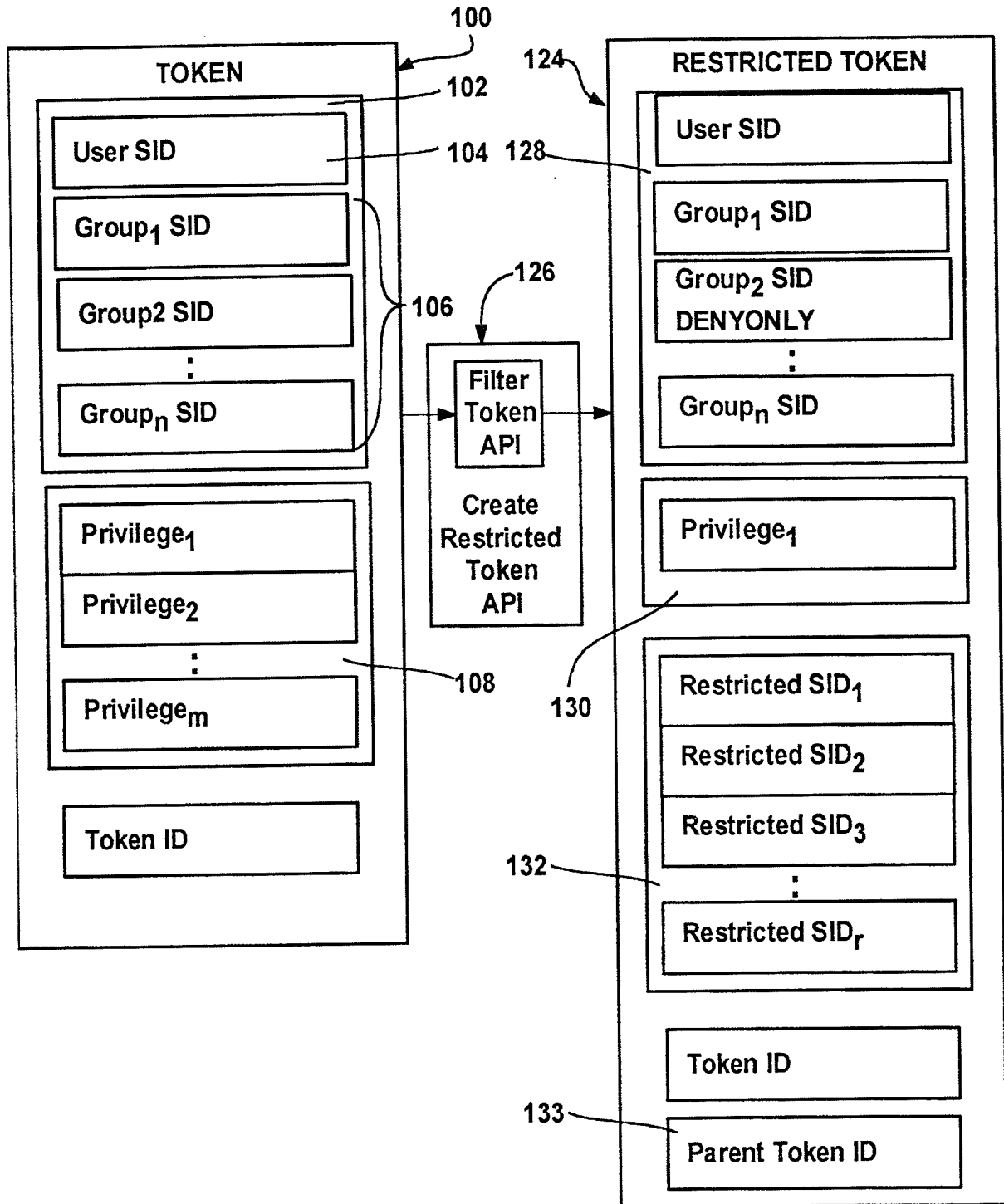
FIG. 5

FIG. 6

**FIG. 7**

**FIG. 8**

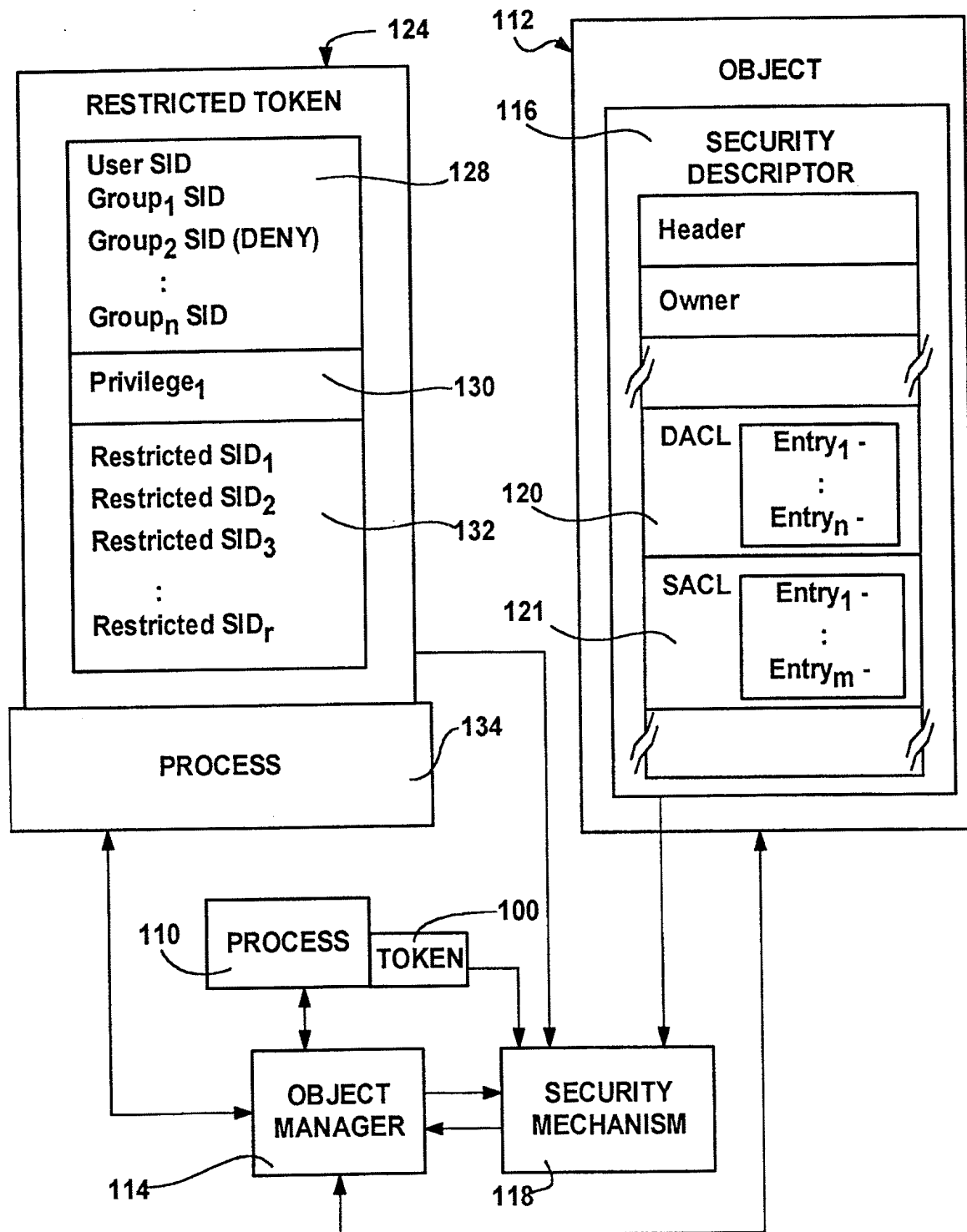


FIG. 9

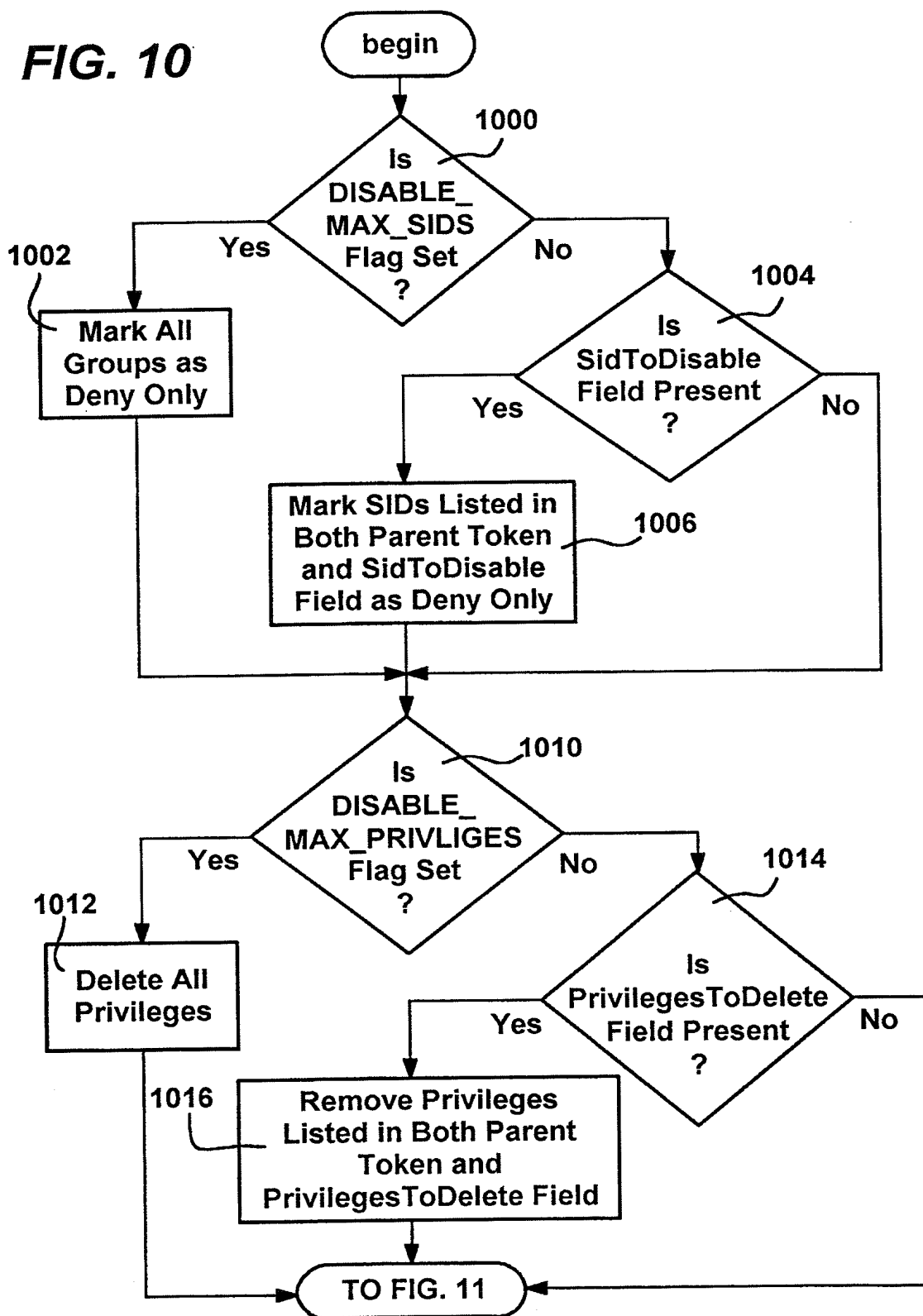
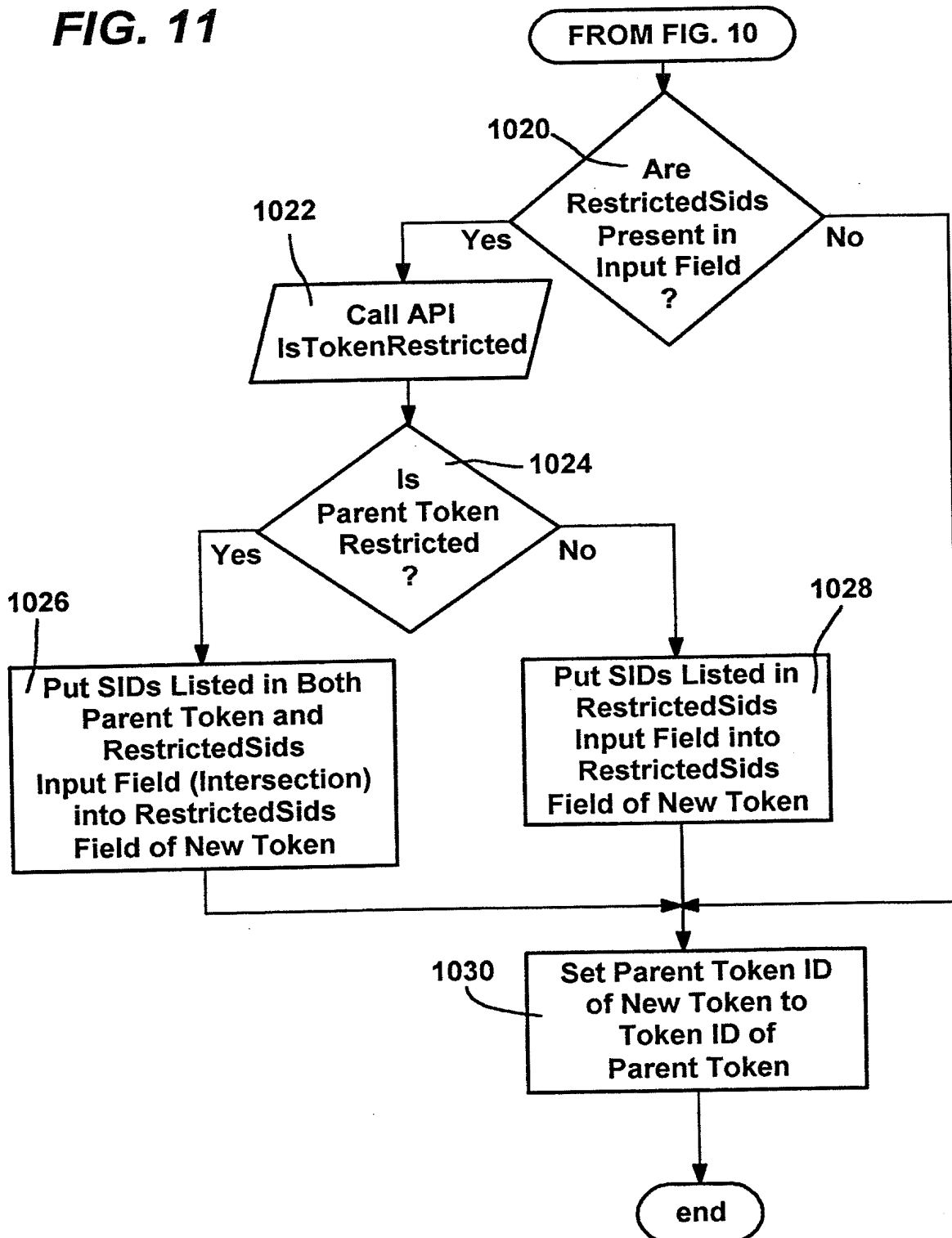
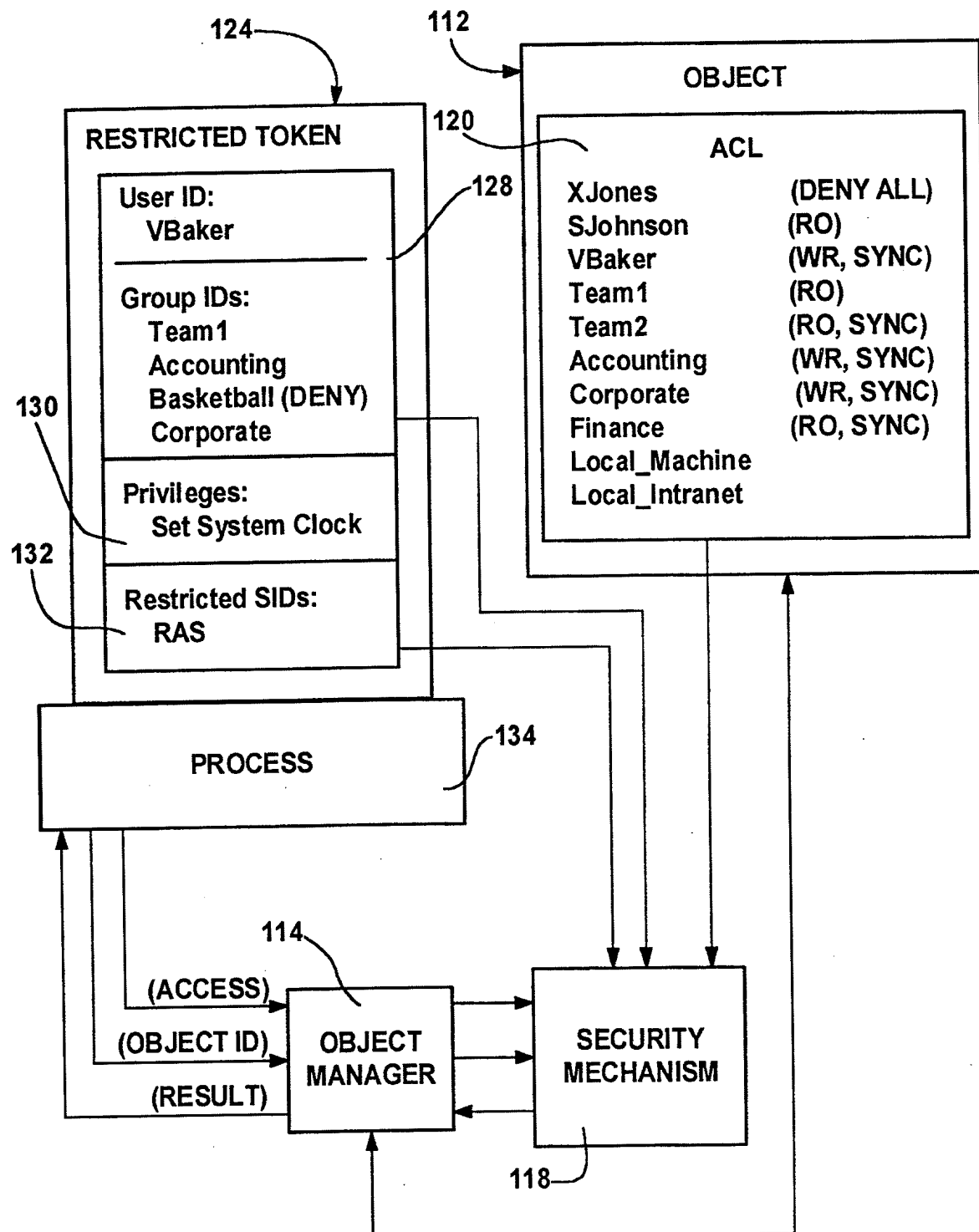
FIG. 10

FIG. 11

**FIG. 12**

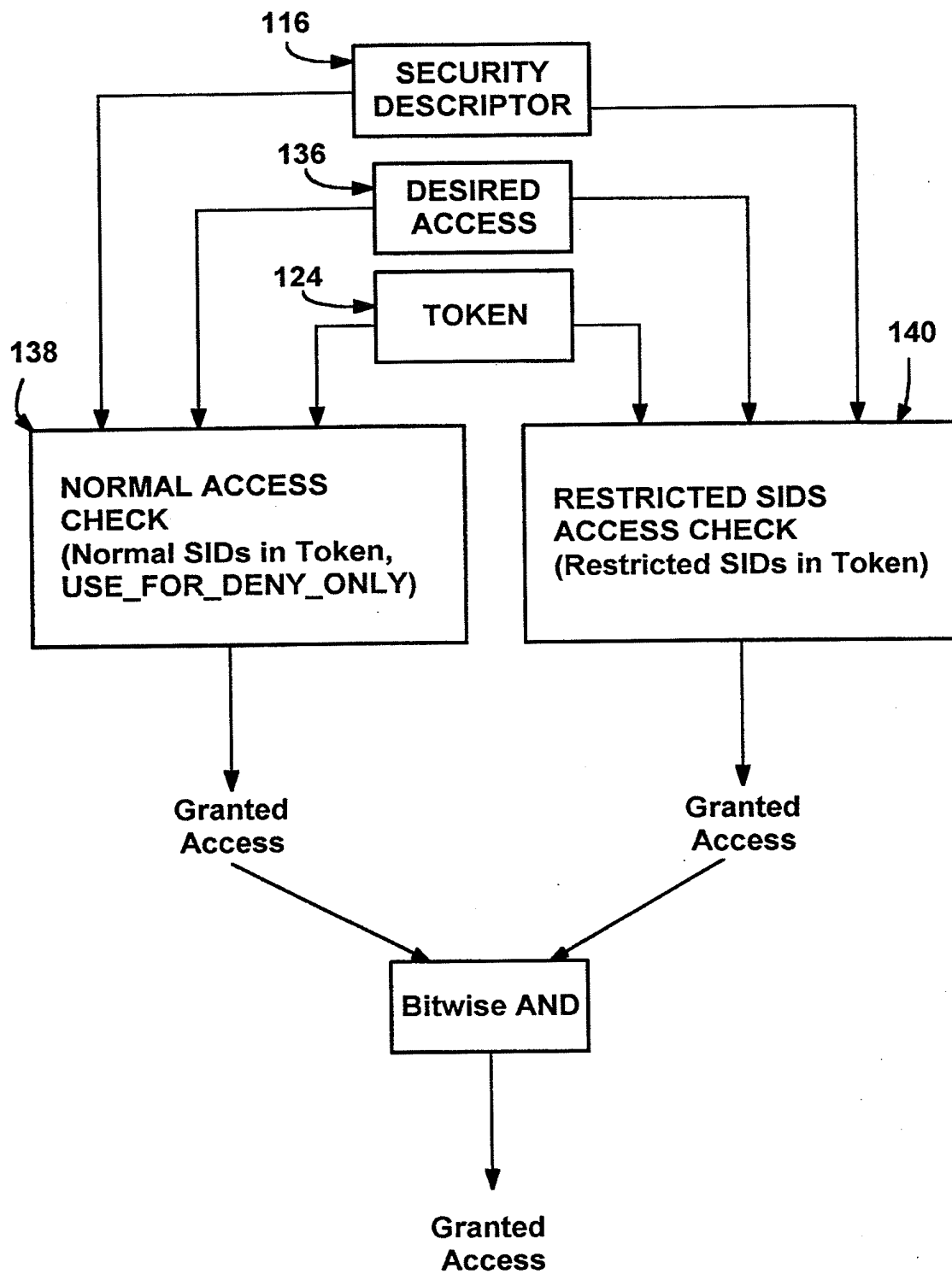
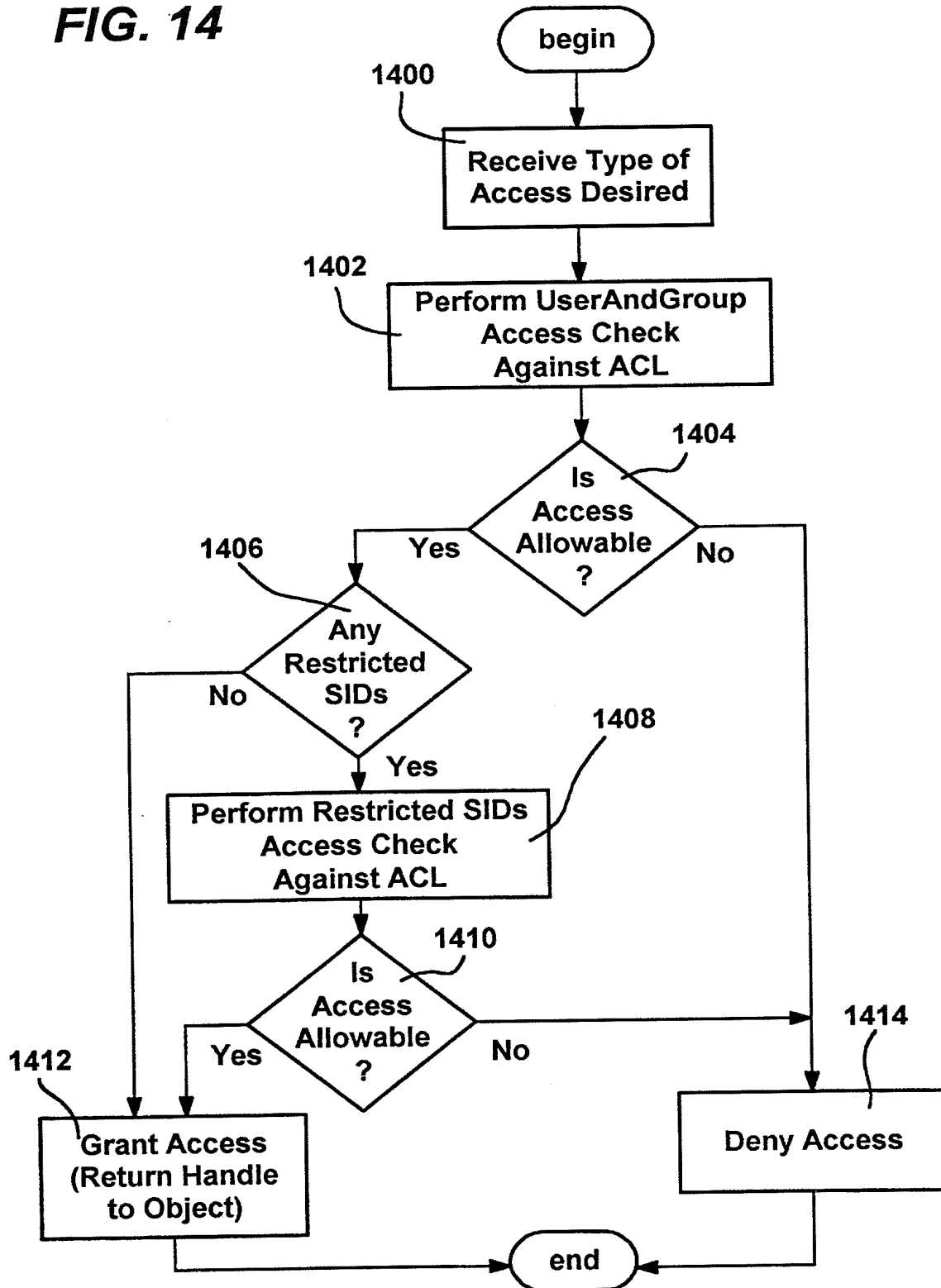
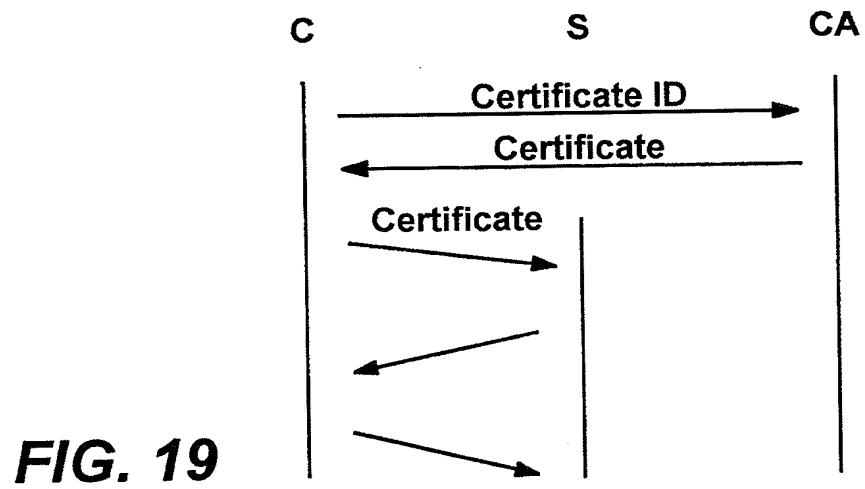
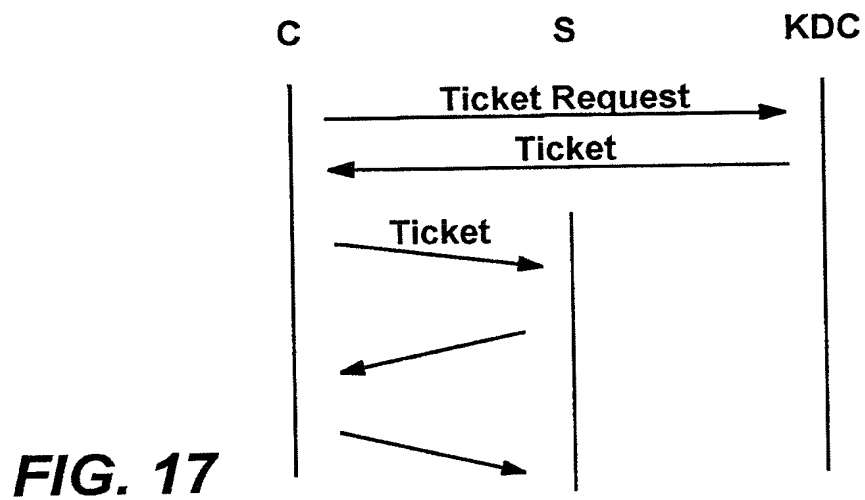
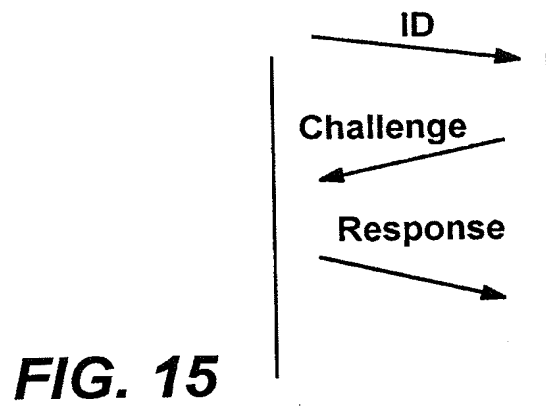
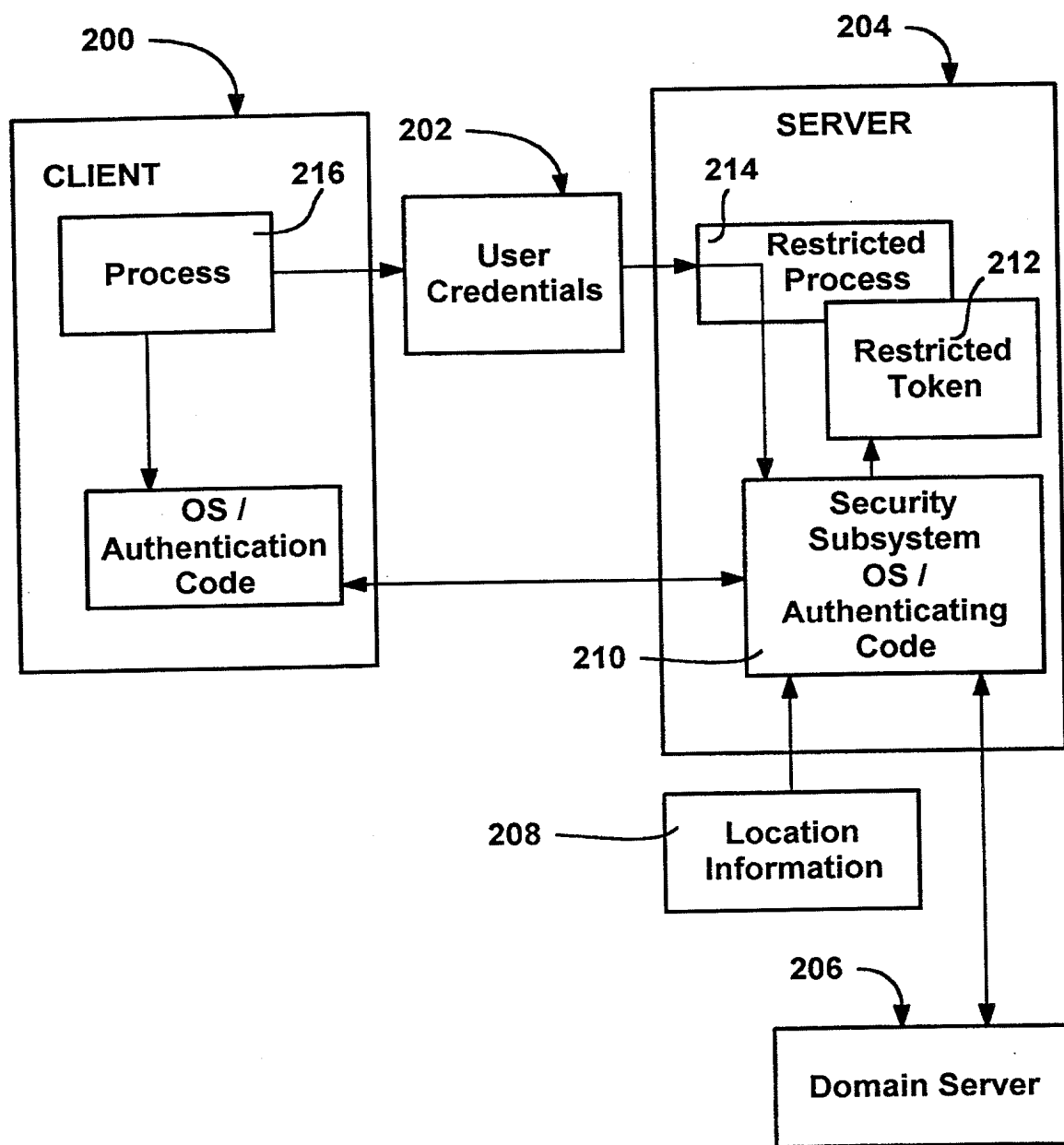
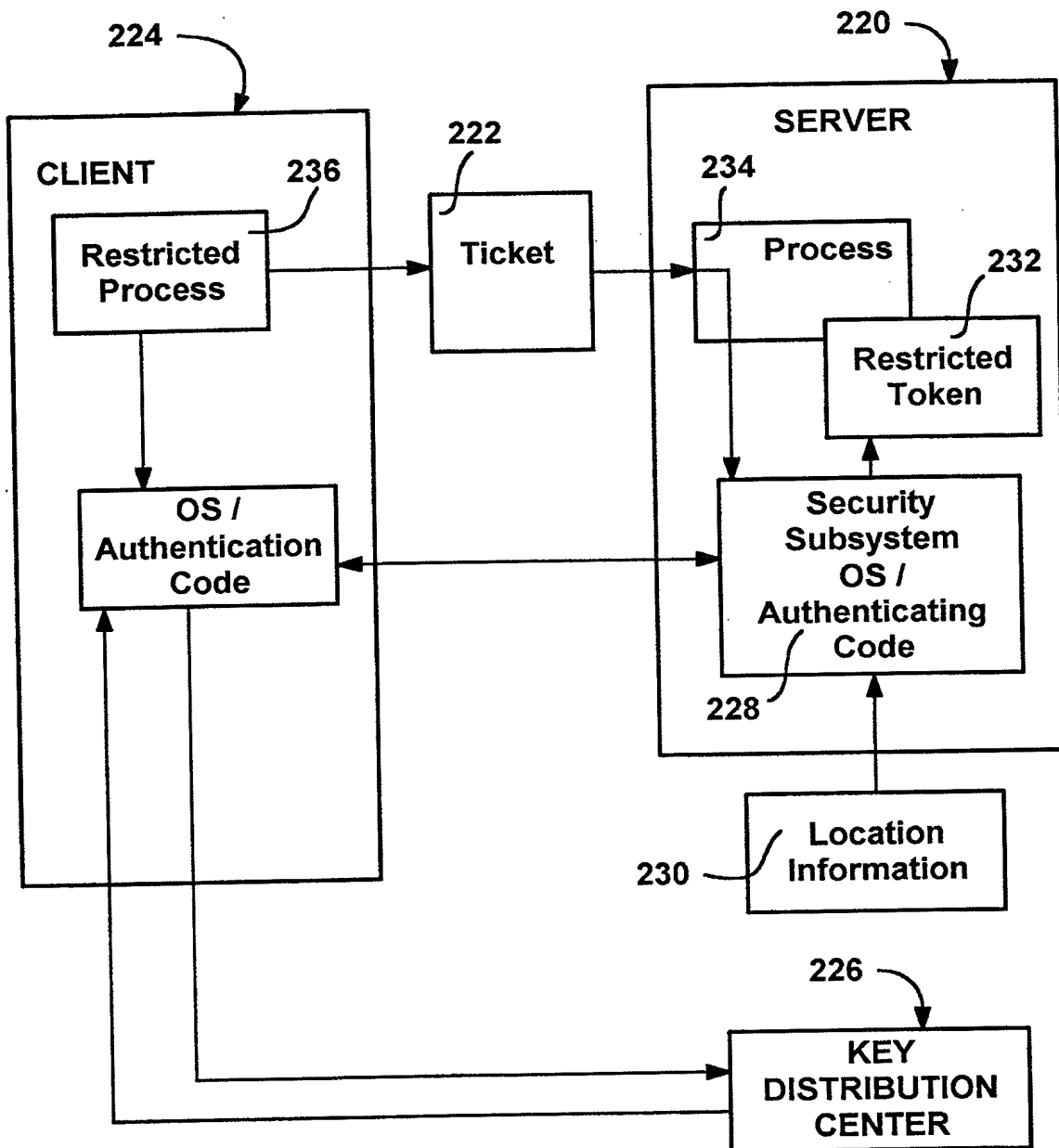
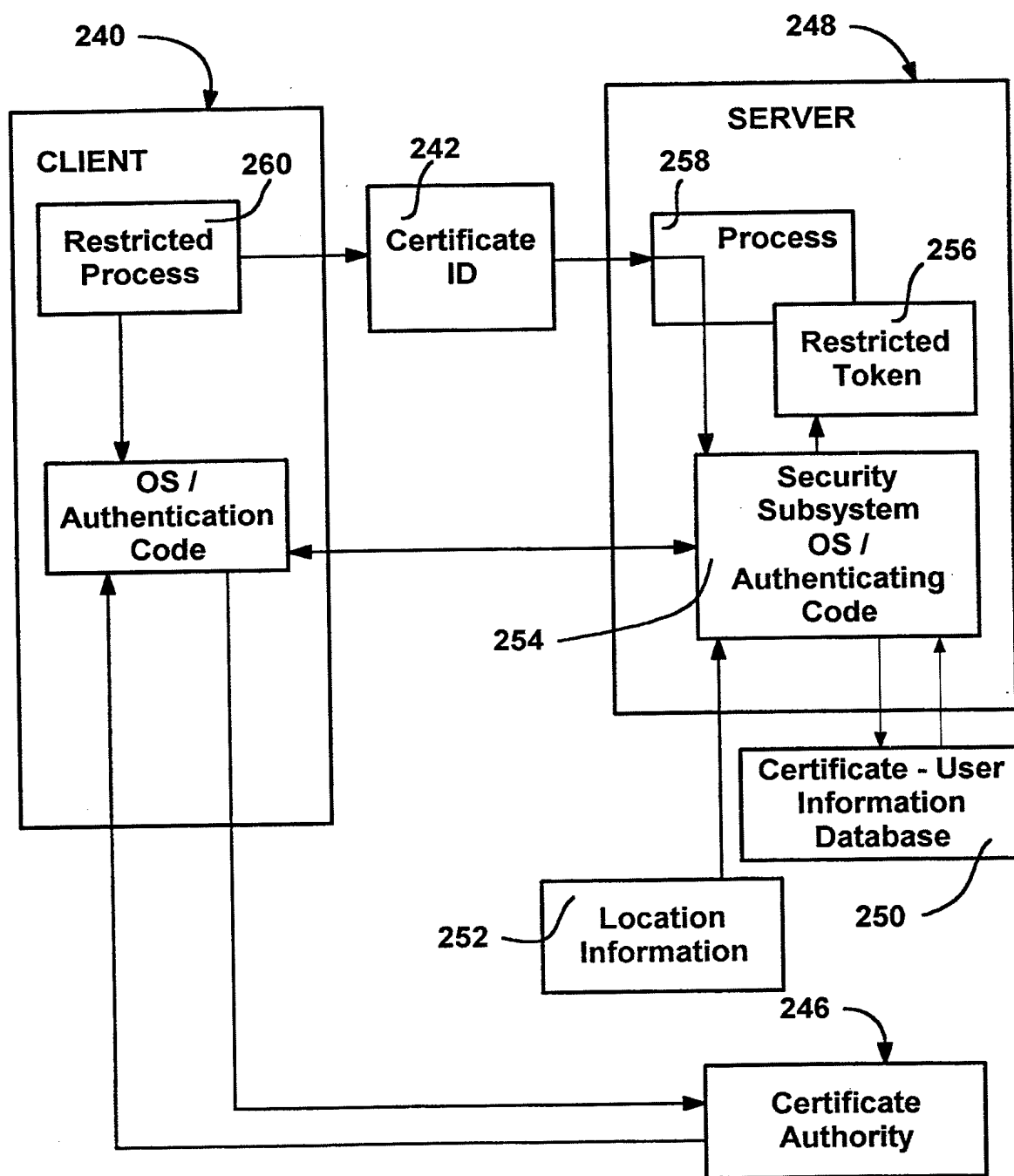


FIG. 14



**FIG. 16**

**FIG. 18**

**FIG. 20**

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 99/12913

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04L29/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04L G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 96 05549 A (SHIVA CORPORATION) 22 February 1996 (1996-02-22) page 8, line 9 -page 9, line 12 ----	1,21,34
A	EP 0 465 016 A (DIGITAL EQUIPMENT CORPORATION) 8 January 1992 (1992-01-08) column 4, line 26 -column 5, line 28 -----	1,21,34



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents :

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed

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"&" document member of the same patent family

Date of the actual completion of the international search

11 October 1999

Date of mailing of the international search report

18/10/1999

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Fax: (+31-70) 340-3016

Authorized officer

Ströbeck, A

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 99/12913

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9605549 A	22-02-1996	AU 3099295 A CA 2197219 A DE 69510551 D EP 0775341 A	07-03-1996 22-02-1996 05-08-1999 28-05-1997
EP 0465016 A	08-01-1992	US 5204961 A CA 2044003 A,C DE 69130657 D DE 69130657 T JP 1996980 C JP 6095991 A JP 7031648 B	20-04-1993 26-12-1991 04-02-1999 22-07-1999 08-12-1995 08-04-1994 10-04-1995

INFORMATION PROCESSOR

Publication number: JP2000330668 (A)

Publication date: 2000-11-30

Inventor(s): NAKAJIMA TAKASHI

Applicant(s): SHARP KK

Classification:

- international: **G06F1/16; G06F3/00; H04B10/10; H04B10/105; H04B10/22; G06H04B10/10; H04B10/105; H04B10/22;** (IPC1-7): G06F1/16; G06F10/105; H04B10/22

- European:

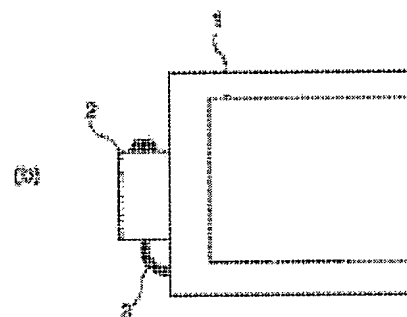
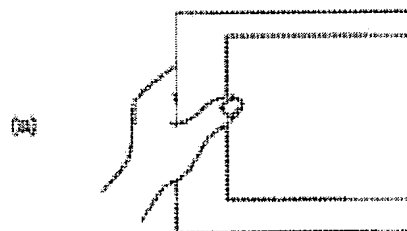
Application number: JP1990142691 19990524

Priority number(s): JP1990142691 19990524

Abstract of JP 2000330668 (A)

PROBLEM TO BE SOLVED: To communicate with external equipment in any direction through simple constitution by providing a processor main body detachably with a transmission and reception part which communicates data to the external equipment under the control of the information processor.

SOLUTION: The information processor main body 1 communicates data to the external equipment by making a transmission and reception part 2 receive and emit infrared rays. The main body 1 is connected to the transmission and reception part 2 by a cable 3. Further, for example, a magnet is provided below the transmission and reception part 2 and the whole or part of the main body 1 is made of a material that the magnet attracts. Thus, the transmission and reception part 2 is detachable from the main body 1, so the transmission and reception part 2 can be fitted to either of the right and left sides of the main body 1. Further, when a user uses the main body 1 in the hand, the transmission and reception part 2 is fitted to the back side of the information processor 1 and then data can be communicated whichever direction communication party equipment is in.



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(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号
特開2000-330668
(P2000-330668A)

(43) 公開日 平成12年11月30日 (2000. 11. 30)

(51)Int.Cl. ⁷	識別記号	F I	テーマコード*(参考)		
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	3/00		3/00		E
H 0 4 B	10/105		1/00	3 1 2 C	
	10/10	H 0 4 B	9/00		R
	10/22				
審査請求 未請求 請求項の数2 O L (全 4 頁)					

審査請求 未請求 請求項の数 2 O L (全 4 頁)

(21) 出願番号 特願平11-142691

(22) 出願日 平成11年5月24日 (1999. 5. 24)

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弁理士 深見 久郎

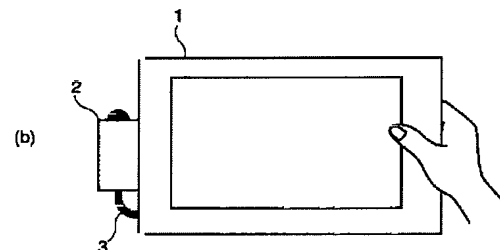
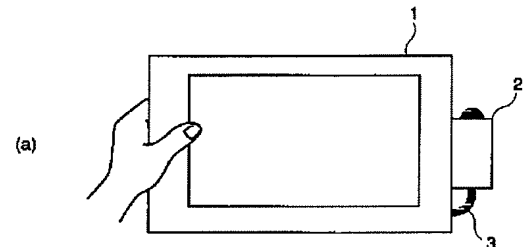
Fターム (参考) 5K002 AA05 AA07 FA03 GA06

(54) 【発明の名称】 情報処理装置

(57) 【要約】

【課題】 簡単な構成によって実現でき、どの方向にある機器との間でもデータ通信を行なうことが可能な情報処理装置を提供すること。

【解決手段】 情報処理装置は、データを処理する情報処理装置本体と、情報処理装置本体に対して着脱可能であり、情報処理装置による制御によって外部機器とデータ通信を行なう送受信部を含む。送受信部は情報処理装置本体に対して着脱可能であるので、送受信部の位置を変更することによってどの方向にある機器との間でもデータ通信を行なうことが可能となる。また、簡単な構成によって情報処理装置を構成することができるため、コストを削減することも可能となる。



【特許請求の範囲】

【請求項1】 データを処理する情報処理装置本体と、前記情報処理装置本体に対して着脱可能であり、前記情報処理装置による制御によって外部機器とデータ通信を行なう送受信部とを含む情報処理装置。

【請求項2】 データを処理する情報処理装置本体と、前記情報処理装置本体に回転可能に取付けられたステージと、前記ステージに対して着脱可能であり、前記情報処理装置による制御によって外部機器とデータ通信を行なう送受信部とを含む情報処理装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、通信機能を備えた情報処理装置に関し、特に、指向性のある通信媒体を用いた通信機能を備えた情報処理装置に関する。

【0002】

【従来の技術】近年、情報処理装置の多機能化、高機能化が進んでおり、装置間でデータを送受信することが可能な通信機能を有する情報処理装置が広く普及している。情報処理装置に備えられた通信機能の1つとして、赤外線通信機能を備えた情報処理装置がある。従来の赤外線通信機能を備えた情報処理装置においては、赤外線を受発光する送受信部が本体に物理的に固定されており、情報処理装置本体を固定した状態では所定方向にある装置との間で通信することしかできない。すなわち、通信方向を変えるためには情報処理装置本体の向きを変えなければならないという問題があった。

【0003】この問題を解決するための技術として、特開平9-83454号公報に開示された発明、特開平9-200139号公報に開示された発明、特開平10-4385号公報に開示された発明および実開平3-39941号公報に開示された考案がある。

【0004】特開平9-83454号公報に開示された赤外線通信カードは、赤外線受発光部と、赤外線受発光部の近傍に着脱自在に取付けられた反射板とを含む。赤外線を反射板で反射させることによって、赤外線受発光部と直接通信可能な角度範囲に配置されていない外部機器に対しても通信が可能となる。

【0005】また、特開平9-200139号公報に開示された赤外線トランシーバは、複数の発光ダイオード(LED)と、複数のLEDの発光端部に隣接してプラットフォームに取付けられたビーム・ディフレクタとを含む。ビーム・ディフレクタは、一連の複合角度表面からなっており、LEDからのビームを所定の角度で偏向するように配列されている。したがって、広範囲にわたる外部機器との赤外線通信が可能となる。

【0006】また、特開平10-4385号公報に開示された電子機器は、電子機器のキャビネット上を移動させることが可能な赤外線送受信部を含む。障害物等によ

って情報伝送を行なうことができない場合でも、赤外線送受信部を移動させ、または回転させて角度調整を行なうことによって情報伝送が可能となる。

【0007】さらには、実開平3-39941号公報に開示されたトランスポンディングカードは、トランスポンディングカードの一辺に設けられた受光部と、受光部を本体に対して可動にする可動部とを含む。

【0008】

【発明が解決しようとする課題】しかし、上述した特開平9-83454号公報に開示された赤外線通信カードは、赤外線を反射板で反射させるため、反射板の構造上の制約を受けることとなり自由度が少ないという問題点がある。

【0009】また、特開平9-200139号公報に開示された赤外線トランシーバは、複数のLEDと、複数のLEDの発光端部に隣接してプラットフォームに取付けられたビーム・ディフレクタとを設ける必要があるため、コストが高くなるという問題点がある。

【0010】また、特開平10-4385号公報に開示された電子機器は、赤外線送受信部が電子機器のキャビネット上を移動する構造を有しているが、電子機器上の特定の場所のみにしか移動できないため、通信範囲が制限されることとなる。

【0011】さらには、実開平3-39941号公報に開示されたトランスポンディングカードは、受光部がトランスポンディングカード本体に対して可動になるように設けられているが、本体が固定されている場合等には自由度が少なくなり、通信範囲が制限されることになる。

【0012】本発明は、上記問題点を解決するためになされたものであり、その目的は、簡単な構成によって実現でき、どの方向にある機器との間でもデータ通信を行なうことが可能な情報処理装置を提供することである。

【0013】

【課題を解決するための手段】請求項1に記載の情報処理装置は、データを処理する情報処理装置本体と、情報処理装置本体に対して着脱可能であり、情報処理装置による制御によって外部機器とデータ通信を行なう送受信部とを含む。

【0014】送受信部は情報処理装置本体に対して着脱可能であるので、送受信部の位置を変更することによってどの方向にある機器との間でもデータ通信を行なうことが可能となる。また、簡単な構成によって情報処理装置を構成することができるため、コストを削減することも可能となる。

【0015】請求項2に記載の情報処理装置は、データを処理する情報処理装置本体と、情報処理装置本体に回転可能に取付けられたステージと、ステージに対して着脱可能であり、情報処理装置による制御によって外部機器とデータ通信を行なう送受信部とを含む。

【0016】ステージは情報処理装置本体に回転可能に取付けられ、送受信部がステージに対して着脱可能であるので、送受信部の位置を変更することによってどの方向にある機器との間でもデータ通信を行なうことが可能となる。また、簡単な構成によって情報処理装置を構成することができるため、コストを削減することも可能となる。

【0017】

【発明の実施の形態】（実施の形態1）図1（a）および図1（b）は、本発明の実施の形態1における情報処理装置の外観例を示す図である。この情報処理装置は、情報処理装置本体1と、情報処理装置本体1に着脱可能に設けられた送受信部2と、情報処理装置本体1および送受信部2を接続するケーブル3を含む。情報処理装置本体1は、送受信部2に赤外線を受発光させることによって、外部の機器とデータ通信を行なう。

【0018】送受信部2の下部には、たとえば、磁石が設けられており、情報処理装置本体1の全部または一部が磁石を吸着する材料によって構成される。このように、情報処理装置本体1に対して送受信部2が着脱可能になっているため、図1（a）に示すように情報処理装置本体1の右側に送受信部2を取付けることが可能であり、図1（b）に示すように情報処理装置本体1の左側に送受信部2を取付けることも可能である。また、通信を行わない時は、送受信部2とケーブル3とを情報処理装置本体1内に収納するような構成にしても良い。また、利用者が情報処理装置本体1を手にとって使用する場合には、図2に示すように送受信部2を情報処理装置本体1の裏側に取付けるようにすれば、通信相手の機器がどの方向にあったとしてもデータ通信が可能になる。

【0019】以上説明したように、本実施の形態における情報処理装置によれば、情報処理装置本体1に送受信部2を着脱可能に設けることによって、外部の機器がどの方向にあったとしてもデータ通信を行なうことが可能となった。また、簡単な構成によって本実施の形態における情報処理装置を構成することができるため、コストを削減することも可能となった。

【0020】（実施の形態2）図3（a）および図3（b）は、本発明の実施の形態2における情報処理装置の外観例を示す図である。この情報処理装置は、情報処理装置本体1と、情報処理装置本体1に着脱可能に設けられた送受信部2と、情報処理装置本体1および送受信部2を接続するケーブル3と、ステージ4と、回転軸6を含む。情報処理装置本体1は、送受信部2に赤外線を受発光させることによって、外部の機器とデータ通信を行なう。ステージ4は、回転軸6によって情報処理装置本体1に接続されており、情報処理装置本体1に対し

てステージ4が自由に回転可能な構造となっている。

【0021】送受信部2の下部には磁石5が設けられており、ステージ4の全部または一部が磁石を吸着する材料によって構成される。このように、ステージ4に対して送受信部2が着脱可能になっているため、利用者はステージ4の回転による向きの変更と、送受信部2の着脱による向きの変更とによって、通信相手の機器がどの方向にあったとしてもデータ通信が可能になる。なお、ステージ4は情報処理装置本体1に対して360°回転するように構成されていなくても良い。たとえば、図4に示すようにステージ4の中央に回転軸6を設け、ステージ4を180°だけ回転できる構成にしておけば、送受信部2の着脱によって送受信部2を適切な位置に固定することによって任意の方向の機器とデータ通信を行なうことが可能となる。

【0022】以上説明したように、本実施の形態における情報処理装置によれば、情報処理装置本体1に対してステージ4が回転可能に設けられ、送受信部2がステージ4に着脱可能に設けられることによって、外部の機器がどの方向にあったとしてもデータ通信を行なうことが可能となった。また、簡単な構成によって本実施の形態における情報処理装置を構成することができるため、コストを削減することも可能となった。

【0023】今回開示された実施の形態は、すべての点で例示であって制限的なものではないと考えられるべきである。本発明の範囲は上記した説明ではなくて特許請求の範囲によって示され、特許請求の範囲と均等の意味および範囲内でのすべての変更が含まれることが意図される。

【図面の簡単な説明】

【図1】本発明の実施の形態1における情報処理装置の外観例を示す図である。

【図2】本発明に実施の形態1における情報処理装置本体1の裏面に送受信部2を取付けた場合を示す図である。

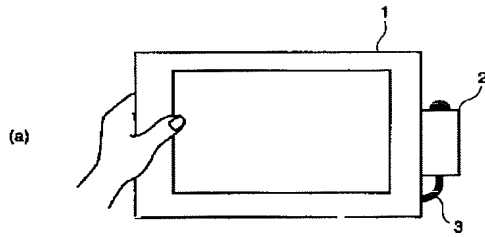
【図3】本発明の実施の形態2における情報処理装置の外観例を示す図である。

【図4】本発明の実施の形態2における情報処理装置の他の外観例を示す図である。

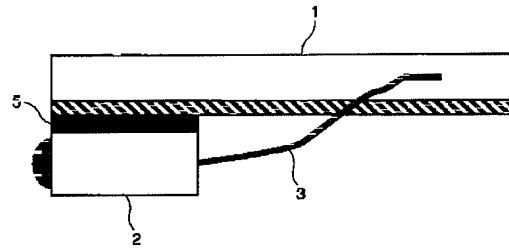
【符号の説明】

- 1 情報処理装置本体
- 2 送受信部
- 3 ケーブル
- 4 ステージ
- 5 磁石
- 6 回転軸

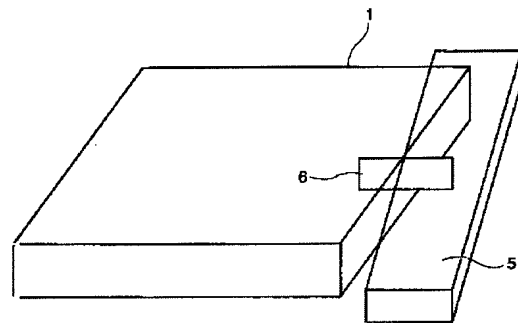
【図1】



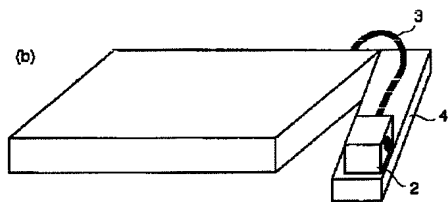
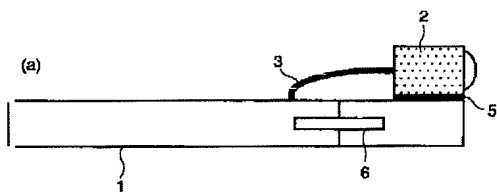
【図2】



【図4】



【図3】



ACCESS LIMIT SYSTEM FOR TERMINAL EQUIPMENT

Publication number: JP2000250860 (A)

Publication date: 2000-09-14

Inventor(s): KIKUCHI MASAKI

Applicant(s): OKI ELECTRIC IND CO LTD

Classification:

- international: G06F1/00; G06F15/00; G06F21/20; G06F1/00; G06F15/00; G06F21/20; (IPC1-7): G06F15/00; G06F1/00

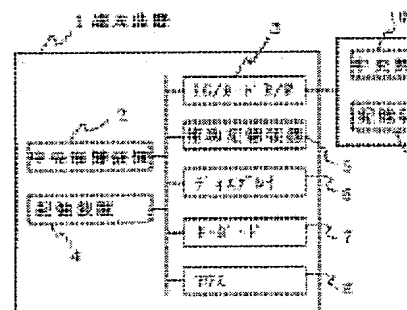
- European:

Application number: JP19990055936 19990303

Priority number(s): JP19990055936 19990303

Abstract of JP 2000250860 (A)

PROBLEM TO BE SOLVED: To permit the strict management of a card and to prevent security from being lowered in the case of access from a plurality of users to terminal equipment with one IC card.
SOLUTION: Concerning this access limit system, when a user connects an IC card 9 to an IC card reader/writer(R/W) 3 of terminal equipment 1 and inputs personal identification information from a keyboard 7 or the like, this personal identification information is sent to the IC card 9 and collated with plural kinds of personal identification information registered in an auxiliary storage device. Then, level information registered in a data area corresponding to the matched personal identification information is sent from the IC card 9 to the terminal equipment 1 and the terminal equipment 1 can be utilized within the access authority based on this level information.



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(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

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特開2000-250860
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(51) Int.Cl. ⁷	識別記号	F I	ターミナル* (参考)
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			3 3 0 C
1/00	3 7 0	1/00	3 7 0 E

審査請求 未請求 請求項の数 3 O L (全 8 頁)

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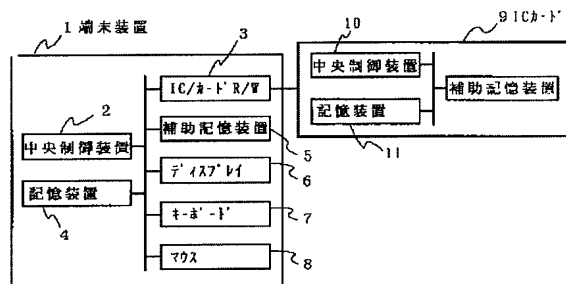
Fターム (参考) 5B085 AE02 AE06 AE12

(54) 【発明の名称】 端末装置のアクセス制限システム

(57) 【要約】

【課題】 厳密なカードの管理を可能にすると共に、1枚のICカードで複数のユーザが端末装置にアクセスする場合のセキュリティ性の低下を防止する。

【解決手段】 ICカード9をユーザが端末装置1のICカードR/W3に接続して、キーボード7等により個人識別情報を入力すると、この個人識別情報がICカード9に送られて補助記憶装置2に登録されている複数の個人識別情報と照合され、一致した個人識別情報に対応するデータ領域に登録されたレベル情報がICカード9から端末装置1に送られて、このレベル情報に基づくアクセス権限内で端末装置1の利用が可能になる。



発明の実施の形態を示すブロック図

【特許請求の範囲】

【請求項1】 各種の入出力装置と各種のデータ及び各種のプログラム等をリソースとして備えた端末装置と、この端末装置の入出力装置の1つであるＩＣカードリーダーに接続されるにＩＣカードとより成り、このＩＣカードを使用して端末装置の利用資格の認証を行う端末装置のアクセス制限システムにおいて、

1枚のＩＣカードに複数のデータ領域を設定して、各データ領域に前記リソースの利用範囲を決定するアクセス権限のレベル情報を登録すると共に、複数のユーザのそれぞれの個人識別情報を登録して、各ユーザのアクセス権限に応じて各個人識別情報を前記データ領域に対応させ、

前記端末装置の利用に当たって、端末装置に入力された個人識別情報と前記ＩＣカードに登録されている個人識別情報を照合して、一致した個人識別情報に対応するデータ領域に登録されたレベル情報を前記ＩＣカードから前記端末装置に通知することを特徴とする端末装置のアクセス制限システム。

【請求項2】 各種の入出力装置と各種のデータ及び各種のプログラム等をリソースとして備えた端末装置と、この端末装置の入出力装置の1つであるＩＣカードリーダーに接続されるＩＣカードとより成り、このＩＣカードを使用して端末装置の利用資格の認証を行う端末装置のアクセス制限システムにおいて、

1枚のＩＣカードに複数のデータ領域を設定して、各データ領域に前記リソースの利用範囲を決定するアクセス権限のレベル情報を登録すると共に、複数のユーザのそれぞれの個人識別情報を登録して、各ユーザのアクセス権限に応じて各個人識別情報を前記データ領域に対応させ、

前記端末装置の利用に当たって、端末装置に入力された個人識別情報と前記ＩＣカードに登録されている個人識別情報を照合して、一致した個人識別情報に対応するデータ領域に登録されたレベル情報を前記ＩＣカードから前記端末装置に通知し、

このレベル情報に基づくアクセス権限により前記端末装置の利用中に新たな個人識別情報が入力されると、この入力された個人識別情報と前記ＩＣカードに登録されている個人識別情報を照合して、一致した個人識別情報に対応するデータ領域に登録されたレベル情報を前記ＩＣカードから前記端末装置に通知してアクセス権限を変更することを特徴とする端末装置のアクセス制限システム。

【請求項3】 請求項1または請求項2において、照合により一致した個人識別情報に対応するデータ領域が複数ある場合、その複数のデータ領域に登録されているレベル情報のうちの最上位のレベル情報をＩＣカードから端末装置に通知することを特徴とする端末装置のアクセス制限システム。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、複数のユーザが利用する端末装置のユーザ毎のアクセス権限を制限する技術に関するもので、特にＩＣカードを利用してアクセス権限を制限する場合のアクセス制限システムに関するものである。

【0002】

【従来の技術】各種業務用等の端末装置として、予め利用資格が与えられたユーザのみに操作を行わせるようにした端末装置がある。その一例としては、銀行等の金融機関の窓口において特定のユーザ（オペレータ）のみが操作する資格を持つ窓口端末装置が知られているが、このような端末装置においては、現金の管理や秘密保持すべきデータの管理上、特定のユーザ以外の者がアクセスできないようにする必要があることから、ＩＣカードに暗証番号やパスワードあるいは指紋等の個人識別情報を登録し、その個人識別情報に基づいてユーザの資格認証を行うようにしたシステムが採用されている。

【0003】このＩＣカードは、単一のＣＰＵとメモリ及びデータファイルで構成されたコンピュータ機能を持つＩＣチップをプラスチック等のカードに埋め込むことにより構成されており、前記データファイルに予め個人識別情報を登録して、端末装置利用の際にユーザが入力した個人識別情報とＩＣカードリーダー・ライタを介して端末装置に接続されたＩＣカードのデータファイルに登録された個人識別情報を照合することにより資格認証が行われるものとなっているが、従来のこの種のシステムにおいて、利用範囲を定めたアクセス権限の異なる複数のユーザが同一の端末装置を利用する場合は、1枚のＩＣカードにアクセス権限を固定した1つの個人識別情報のみを割り当て、ユーザはそのアクセス権限による範囲内で端末装置を利用できるようにしている。

【0004】

【発明が解決しようとする課題】しかしながら、上述した従来の技術では、複数のユーザが個々にＩＣカードを保有することから、厳密なカード管理を行いにくなり、ＩＣカードの数が多ければ紛失等の事態も生じ易くなるので、セキュリティ性が低くなるという問題がある。

【0005】その対策として1枚のＩＣカードで複数のユーザが端末装置を利用できるようにすれば、ＩＣカードの管理はし易くはなるが、アクセス権限の異なるユーザが同一のＩＣカードを使用することになるので、ユーザ毎のアクセス権限を設定することが困難となり、やはりセキュリティ性に問題を生じることになる。従って、本発明は、1枚のＩＣカードでユーザ毎のアクセス権限を設定して端末装置を利用させることが可能な端末装置のアクセス制限システムを提供することを課題とする。

【0006】

【課題を解決するための手段】そのため、本発明は、各種の入出力装置と各種のデータ及び各種のプログラム等をリソースとして備えた端末装置と、この端末装置の入出力装置の1つであるICカードリーダライタに接続されるICカードとより成り、このICカードを使用して端末装置の利用資格の認証を行う端末装置のアクセス制限システムにおいて、1枚のICカードに複数のデータ領域を設定して、各データ領域に前記リソースの利用範囲を決定するアクセス権限のレベル情報を登録すると共に、複数のユーザのそれぞれの個人識別情報を登録して、各ユーザのアクセス権限に応じて各個人識別情報を前記データ領域に対応させ、前記端末装置の利用に当たって、端末装置に入力された個人識別情報と前記ICカードに登録されている個人識別情報を照合して、一致した個人識別情報に対応するデータ領域に登録されたレベル情報を前記ICカードから前記端末装置に通知することを特徴とする端末装置のアクセス制限システム。

【0007】

【発明の実施の形態】以下に図面を参照して本発明による端末装置のアクセス制限システムの実施の形態について説明する。図1は実施の形態を示すブロック図、図2は要部の外観を示す側面図である。図において1は端末装置で、この端末装置1は中央制御装置(CPU)2、ICカードリーダ/ライタ(以下ICカードR/Wと略記する)3、RAM等による主記憶装置4、ハードディスク等の補助記憶装置5、CRTまたはLCD等によるディスプレイ6、キーボード7、マウス(ポインティングデバイス)8等を備えている。

【0008】ここでICカードR/W3は、後述するICカードに対してデータの読み取りと書き込みを行うものであって、端末装置1とICカードの互いのデータの入出力を中継する装置である。CPU主記憶装置4は補助記憶装置5から読み出したプログラムや各種のデータを格納するメモリで、補助記憶装置5は端末装置1が取り扱うデータや各種のアプリケーション等のプログラムを格納するものである。

【0009】ディスプレイ6はプログラムに対応した画面や入力ガイダンス及び入力データ等の表示を行う表示手段で、キーボード7はデータをキー入力する入力手段、マウス8はディスプレイ7上のカーソルを移動してデータの選択入力を行うものである。これら3～8の構成要素はバスを介して中央制御装置2に接続されており、中央制御装置2はこれら全体を制御するものとして働く。

【0010】尚、前記ICカードR/W3、ディスプレイ6、キーボード7、マウス8は端末装置1の入出力装置であるが、このほかにもプリンタやスキャナ等の入出力装置を備えるものであってもよく、更に金融機関の窓口端末装置であれば紙幣や硬貨の入出金機も備えるもの

となる。9はプラスチック等のカード基材内部にICチップを設けることにより構成されたICカードで、前記ICチップは、中央制御装置10と主記憶装置11と補助記憶装置12により構成されている。

【0011】ここで主記憶装置11は中央制御装置10により補助記憶装置11から読み出したプログラムや各種のデータを格納するメモリで、補助記憶装置11はICカード3が取り扱うデータや各種のアプリケーション等のプログラムを格納すると共に、端末装置1にアクセスするユーザの個人識別情報等のデータを登録する不揮発性メモリである。

【0012】図3はICカード3の補助記憶装置12に登録する情報の例を示す図である。この図に示したように、本実施の形態では補助記憶装置12に複数のデータ領域を設け、各データ領域にレベル情報を1つ登録すると共に、複数の個人識別情報登録領域を設けて、それぞれの個人識別情報登録領域に端末装置1を利用する資格を持つ各ユーザの個人識別情報を登録するものとなっている。

【0013】ここで、レベル情報はそれぞれのユーザに与えられたアクセス権限に基づいて端末装置1の各種の入出力装置と各種のデータ及び各種のプログラム等のリソースに対する利用範囲を制限するための情報であり、各ユーザの個人識別情報はデータ領域のレベル情報に対応するものとなっている。このレベル情報は、レベル1、レベル2・・・のようにランク付けされ、この例では数値の大きいものを上位としている。

【0014】これらのレベル情報を必ず1つ持つデータ領域は個人識別情報の入力を行わなければ利用することができない(以下ロックという)仕組みを用いている。すなわち、図3において各データ領域はロックされた状態を示しており、端末装置1から送られてくる個人識別情報と補助記憶装置12に登録された個人識別情報が一致した場合、その個人識別情報に対応するデータ領域のロックが解除されるものとなっている。

【0015】このようにすることで、本実施の形態では1つのデータ領域に対して1つの個人識別情報を割り当てるだけでなく、複数の個人識別情報で同じデータ領域のロック解除を可能とし、更に1つの個人識別情報で複数のデータ領域のロック解除が行えるようにしている。つまり、個人識別情報とデータ領域は1対1で対応させる必要はなく、1つの個人識別情報が複数のデータ領域と対応可能としている。

【0016】例えば図3の例では、個人識別情報Dはデータ領域3と4に対応させそれぞれのレベル1とレベル3が得られるようにしている。このような個人識別情報に基づいて、端末装置1ではレベル情報単位のアクセス権切替えソフトが実行される。ここでいうレベル単位アクセス権切替えソフトとは、ユーザの資格認証後にICカード3から受け渡されるレベル情報を用いてアクセス

可能なリソースの制限を行うソフトであり、レベル情報とリソース毎のアクセス権の対応は予め設定しておく。

【0017】図4はこのアクセス管理のためのソフトウェアの構成例を示す図である。この図に示したようにICカード9からのレベル情報によりアクセス権切替えソフトがリソース毎のアクセス権を決定するもので、アプリケーションがリソースへアクセスするとき、アクセス権があればアクセス権切替えソフトはリソースをアプリケーションに受け渡す。つまり図4において①→②→③の流れとなる。

【0018】一方、アプリケーションがリソースへアクセスするとき、アクセス権がなければアクセス権切替えソフトはリソースをアプリケーションに渡さず、従ってこのときは、図4において①→④の流れとなる。本発明は、複数の個人識別情報が登録されているICカード9をICカードR/W3に接続し、個人識別情報の入力により各ユーザに割り当てられた個人識別情報に基づいてアクセス権限を制限し、その制限の中で端末装置1の利用を可能とするもので、以下にフローチャートを参照してその詳細を説明する。

【0019】図5は上述した構成の動作を示すフローチャートで、このフローチャートにより本実施の形態の一連の動作について説明する。まず、端末装置1のICカードR/W3にICカード9が接続されていない状態では、端末装置1の中央処理装置2は他のすべての処理を受け付けず、ICカードR/W3へのICカード9の接続を待つ(S1)。

【0020】ここでいう他のすべての処理とは、ICカードR/W3以外のキーボード7やマウス8等の入力装置からの情報入力を意味する。そこで、あるユーザがICカード3をICカードR/W2に接続すると、端末装置1の中央処理装置2は、例えばパスワード等の個人識別情報の入力を促すためのログイン画面をディスプレイ6に表示して個人識別情報の入力を待つ。

【0021】これを見てユーザがキーボード7等を操作して個人識別情報を入力すると(S3)、中央処理装置2はICカードR/W3を介してICカード9内の情報への接続を試みる。すなわち、端末装置1の中央処理装置2はユーザにより入力された個人識別情報をICカード9の中央処理装置10へ送って資格認証を依頼する。

【0022】これを受けて中央処理装置10は補助記憶装置12に登録されている個人識別情報と照合し、一致する個人識別情報があるか否かを判断する(S4)。その結果、一致する個人識別情報があった場合は、資格認証ができたものとしてその個人識別情報に対応するデータ領域のロックが解除され、このデータ領域のレベル情報が読み出されて端末装置1の中央処理装置4に送られるが、複数のデータ領域のロックが解除された場合は、その複数のデータ領域におけるレベル情報のうちの最上位のレベル情報が選択され端末装置1の中央処理装置4

に送られる(S5)。

【0023】図6はデータ領域のロックが解除された状態を示す図で、同図(a)はデータ領域が1つだけロック解除された場合、同図(b)は2つのデータ領域のロックが解除された状態を示す図である。図(a)の例では個人識別情報Aの入力によりデータ領域1のみのロックが解除されているので、そのレベル1の情報が端末装置1の中央処理装置2に送られる。

【0024】また、図(b)の例では個人識別情報Bの入力によりデータ領域1とデータ領域2の両方のロックが解除されているので、レベル1とレベル2の情報のうちの上位のレベル2の情報が端末装置1の中央処理装置2に送られる。端末装置1の中央処理装置1はICカード9からレベル情報を受け取ると、このレベル情報に基づいて前記図4で説明したリソースへのアクセス管理を行い、アクセス可能なリソースにより処理を実行する(S6)。

【0025】この処理において中央処理装置2は、例えばICカードR/W3からのICカード9の抜き取りや、ユーザがログアウト等の手続きによりアクセス状態を終了させた等の処理終了の条件を満たすかどうかを判断し(S7)、終了条件を満たしていればS1へ戻り、終了条件を満たしていない場合はS6に戻って処理を継続する。

【0026】一方、前記S4での照合の結果、一致する個人識別情報がない場合は、データ領域のロック解除は行われず、資格認証ができない旨の通知が端末装置1の中央処理装置2に送られ(S7)、これにより処理はS1に戻る。尚、図5には図示していないが、予め個人識別情報の入力のリトライ可能回数を決めておき、ICカードR/W3にICカード3が接続されたまま、S1～S4及びS8の処理を繰り返すことで、個人識別情報の入力回数が前記リトライ可能回数を越えた場合、所定の管理者にアラーム等で警報するようにしておくとい。

【0027】以上の動作により複数の個人識別情報が登録された1枚のICカード3を使用し、ユーザのレベル情報によるアクセス制限のもとに端末装置1に種々の処理を実行させることができる。つまり複数の個人識別情報に対応させてアクセス権限のレベルを設定することによって各ユーザ毎に端末装置1のアクセス制限が可能になるため、1枚のICカードで複数のユーザが端末装置にアクセスする場合のセキュリティ性の低下を防止することができる。

【0028】以上のようにすることによって複数の個人識別情報が登録された1枚のICカード3を使用し、各ユーザのレベル情報によるアクセス権限を制限して端末装置1を利用させ、種々の処理を実行させることができる。つまり複数の個人識別情報に対応させてアクセス権限のレベルを登録することによって各ユーザ毎に端末装置1のアクセス権限を制限することが可能になるため、

1枚のICカードで複数のユーザが端末装置を利用する場合、カードの管理が容易になると共に端末装置に対するセキュリティ性の低下を防止することができる。

【0029】次に、実施の形態の別の動作例について説明する。この動作例は先の動作を拡大したもので、先の動作で行われたあるユーザのアクセス権限により端末装置が利用されている状態において、別のユーザの個人識別情報の入力によりアクセス権限を変更する動作を追加したものである。この場合の動作を図7のフローチャートにより順次説明する。

【0030】まず、S1～S8の動作については図5の場合と同一であるので、その説明は省略する。S7で処理終了の条件が満たされない場合、端末装置1の中央処理装置2は新たな個人識別情報の入力が行われたか否かを判断し(S9)、入力が行われない場合は、S6に戻って処理を継続する。

【0031】新たな個人識別情報の入力が行われた場合は、入力された個人識別情報をICカード9の中央処理装置10へ送って資格認証を依頼する(S10)。これを受けて中央処理装置10は補助記憶装置12に登録されている個人識別情報と照合し、一致する個人識別情報があるか否かを判断する(S11)。その結果、一致する個人識別情報があった場合は、資格認証ができたものとしてその個人識別情報に対応する新たなデータ領域のロックが解除され、前に入力された個人識別情報によってロックが解除されたデータ領域を含めてすべてのデータ領域内のレベル情報のうちの最上位のレベル情報が選択され、端末装置1の中央処理装置2に送られる(S12)。

【0032】図8は新たに入力された個人識別情報により新たなデータ領域のロックが解除された場合の説明図で、同図(a)は新たな個人識別情報の入力前の状態、同図(b)は入力後の状態を示している。この例では、新たな個人識別情報の入力前の状態では図(a)に示したようにデータ領域1のみがロック解除された状態にあり、レベル1によりアクセスの制限を行っていたが、図(b)に示したように新たに個人識別情報Dが入力されたことにより、データ領域3とデータ領域4のロックが解除され、データ領域4に登録されたより高い権限を持つレベル3のアクセス制限により端末装置1の利用が可能となる。

【0033】尚、新たなデータ領域のロックが解除されなくても、一致する個人識別情報が既にロック解除されているデータ領域に対応するものであれば、そのデータ領域のレベル情報が端末装置1の中央処理装置4に送られる。その後、S6に移行してアクセス可能なりソースにより処理を実行する。一方、一致する個人識別情報がなかった場合は、新たに個人識別情報が入力される前のレベル情報が端末装置1の中央処理装置2に送られ(S13)、S6へ戻る。

【0034】以上の動作により複数の個人識別情報が登録された1枚のICカードを使用して、あるユーザのレベル情報によるアクセス制限で端末装置が利用されている状態のまま、別のユーザによる高いレベル情報によりアクセス権限を変更拡大することができる。つまり、1枚のICカードに複数の個人識別情報が登録されている場合において、複数の個人識別情報によりロックが解除されるデータ領域が増加することによって、既に割り当てられているレベル情報より上の権限を別のユーザから譲渡することができ、ICカード内のデータ領域、レベルを新たに割り当てるという手間をかけずにアクセス権限を拡大することが可能になる。

【0035】尚、本発明を金融機関の窓口端末装置に適用する場合、ICカードは責任者が必ず所持するものとして、この責任者には高いアクセス権限を割り当て、実際に端末装置を利用して各種の処理を実行させるオペレータ(ユーザ)のアクセス権限は責任者より低いレベル内で個別に登録しておく。このようにすれば、登録オペレータ以外は利用不可能となるので、セキュリティ性は高くなり、かつ必要に応じて個別に権限の譲渡が可能であるので、柔軟な利用形態が実現されることになる。

【0036】また、この他の利用形態としては、電子マネー対応のICカードを家族で利用することが考えられる。その場合、1枚のカードで家族一人一人について個別に利用制限をかけることでそれぞれ利用金額の上限の設定が可能となるので、子供が誤ってお金を使い過ぎてしまう等の事態を防ぐことができ、かつ必要に応じて親の設置金額を子供に譲渡することができるので、柔軟な資金利用が可能になる。

【0037】

【発明の効果】以上説明したように、本発明は、各種の入出力装置と各種のデータ及び各種のプログラム等をリソースとして備えた端末装置と、この端末装置の入出力装置の1つであるICカードリーダライタに接続されるICカードとより成り、このICカードを使用して端末装置の利用資格の認証を行う端末装置のアクセス制限システムにおいて、1枚のICカードに複数のデータ領域を設定して、各データ領域に前記リソースの利用範囲を決定するアクセス権限のレベル情報を登録すると共に、複数のユーザのそれぞれの個人識別情報を登録して、各ユーザのアクセス権限に応じて各個人識別情報を前記データ領域に対応させ、前記端末装置の利用に当たって、端末装置に入力された個人識別情報と前記ICカードに登録されている個人識別情報を照合して、一致した個人識別情報に対応するデータ領域に登録されたレベル情報を前記ICカードから前記端末装置に通知するようにしている。

【0038】従ってこれによれば、ICカードを使用して複数のユーザに端末装置を利用させる場合でもICカードは1枚だけで済むため、厳密なカード管理が可能に

なると共に、各ユーザ毎に設定されているアクセス権限のレベルで端末装置を利用させることができるので、1枚のICカードで複数のユーザが端末装置にアクセスする場合のセキュリティ性の低下を防止することができるという効果が得られる。

【図面の簡単な説明】

【図1】 発明の実施の形態を示すブロック図である。

【図2】 実施の形態の要部側面図である。

【図3】 ICカードに登録する情報の例を示す図である。

【図4】 アクセス管理のためのソフトウェアの構成例を示す図である。

【図5】 実施の形態の動作を示すフローチャートである。

【図6】 データ領域のロックが解除された状態を示す図である。

【図7】 実施の形態の別の動作例を示すフローチャート

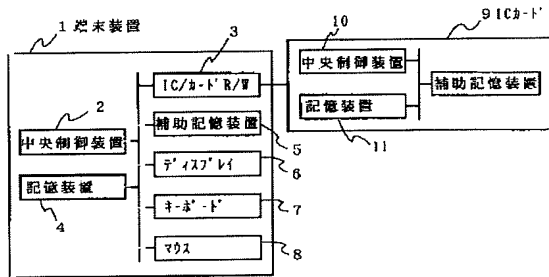
である。

【図8】 新たなデータ領域のロックが解除された場合の説明図である。

【符号の説明】

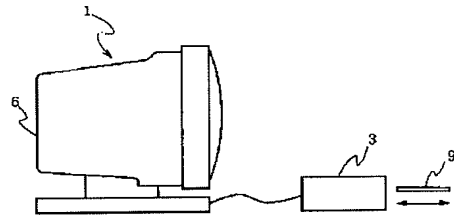
- 1 端末装置
- 2 中央制御装置
- 3 ICカードリーダー/ライタ
- 4 主記憶装置
- 5 補助記憶装置
- 6 ディスプレイ
- 7 キーボード
- 8 マウス
- 9 ICカード
- 10 中央制御装置
- 11 主記憶装置
- 12 補助記憶装置

【図1】



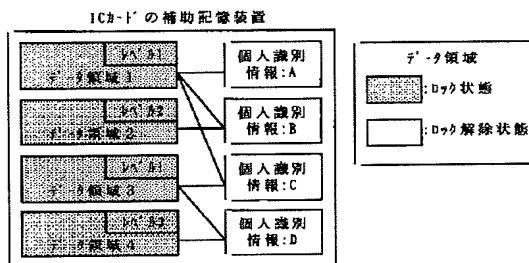
発明の実施の形態を示すブロック図

【図2】



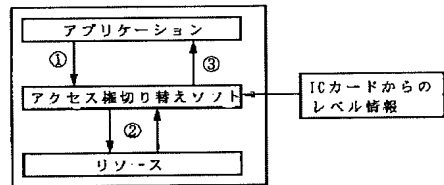
実施の形態の要部側面図

【図3】



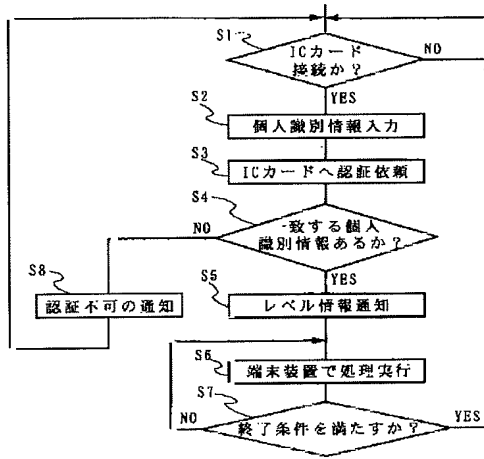
ICカードの登録情報の例を示す図

【図4】



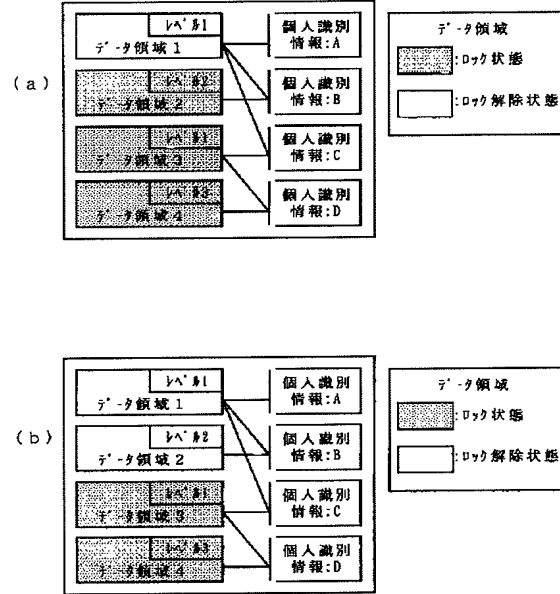
アクセス管理のためのソフトウェアの構成を示す図

【図5】



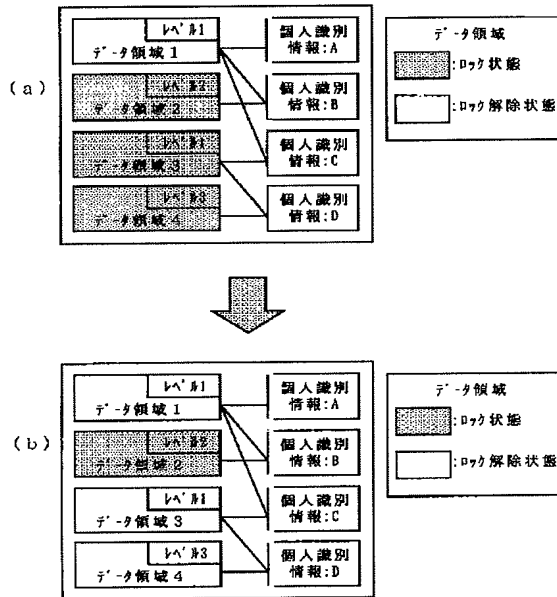
実施の形態の動作を示すフローチャート

【図6】



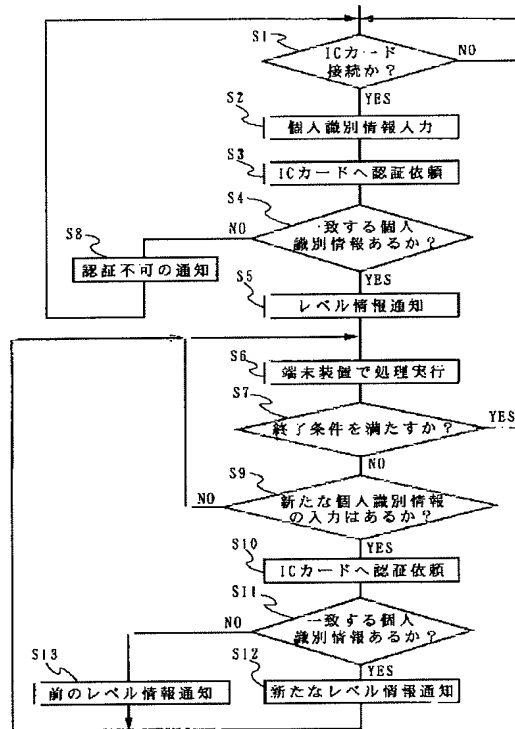
データ領域のロックが解除された状態を示す図

【図8】



新たなデータ領域のロック解除の説明図

【図7】



実施の形態の別の動作例を示すフローチャート